MACHINERY

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Each size of lathe in the D.S.G. range incorporates a totally enclosed screwcutting Gearbox, providing the means for rapidly selecting thread pitches.

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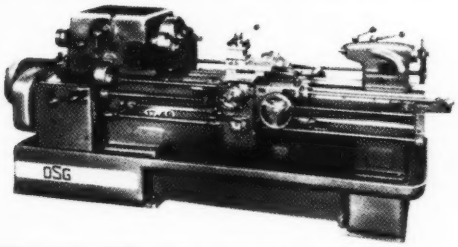
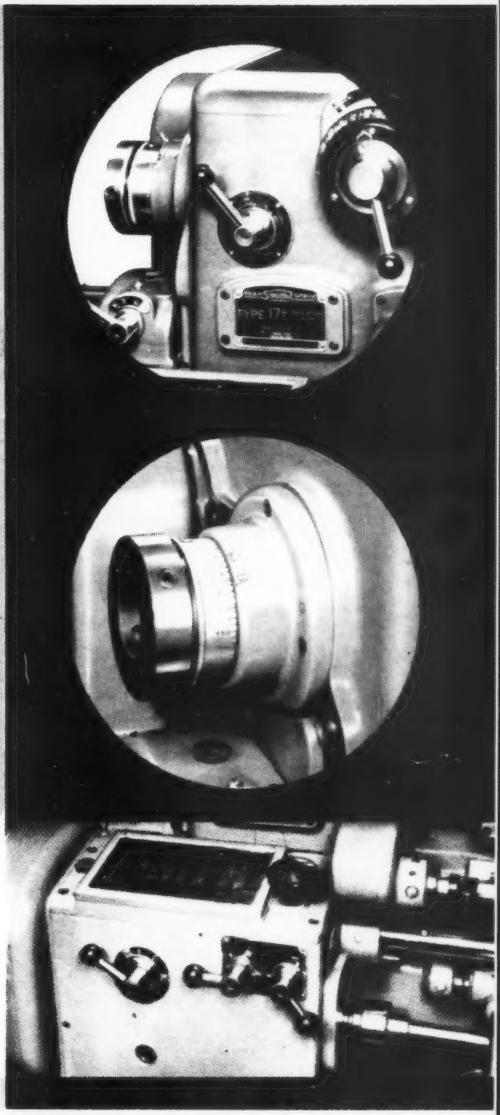
The lathe spindle is fitted with an indexing dial which indicates the precision indexing obtained from a ground divider in the Headstock. This dial is standard equipment on TYPES 13-1 and 17 Toolroom lathes

WHEN MULTI-START AND COARSE PITCH THREADING, THE COMBINATION OF THESE FEATURES ENSURES THAT ALL THE ABOVE ADVANTAGES ARE OBTAINED.





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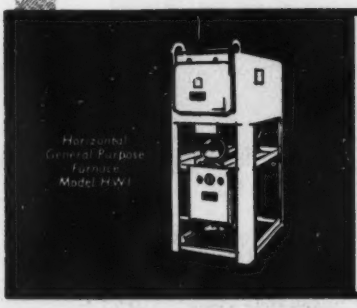
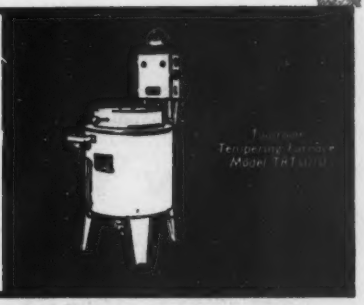

Horizontal General Purpose Furnace Model HGV1

Electrode Salt Bath. Model ESB 67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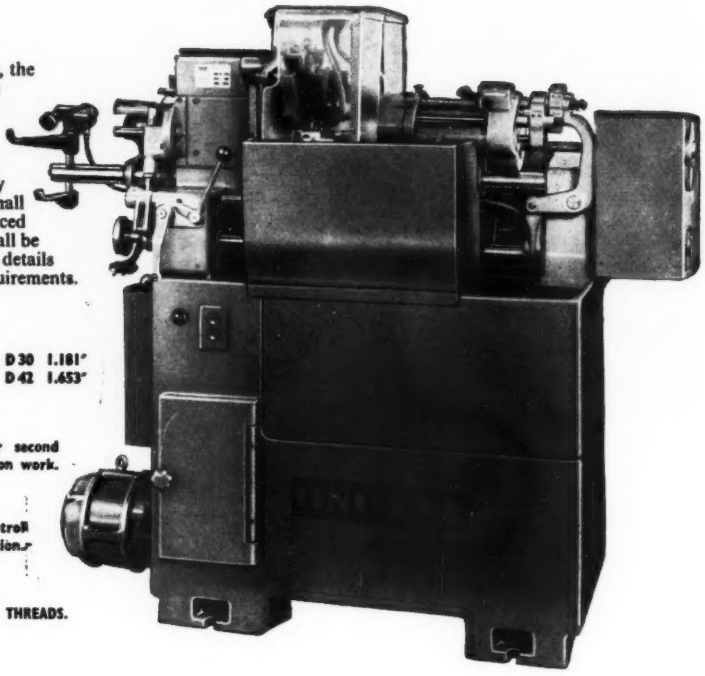

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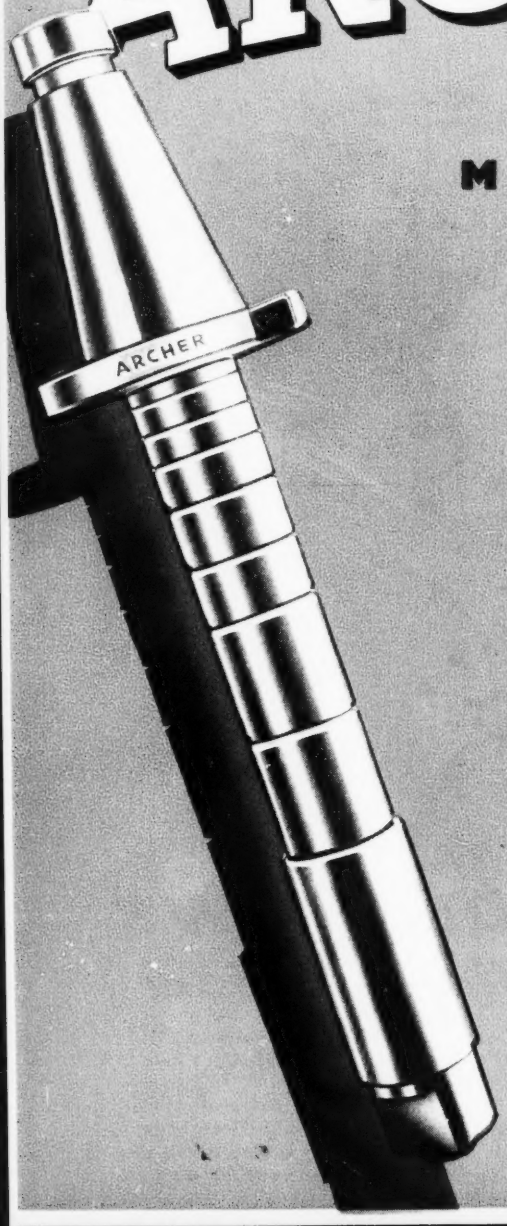

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10" × 1" up to
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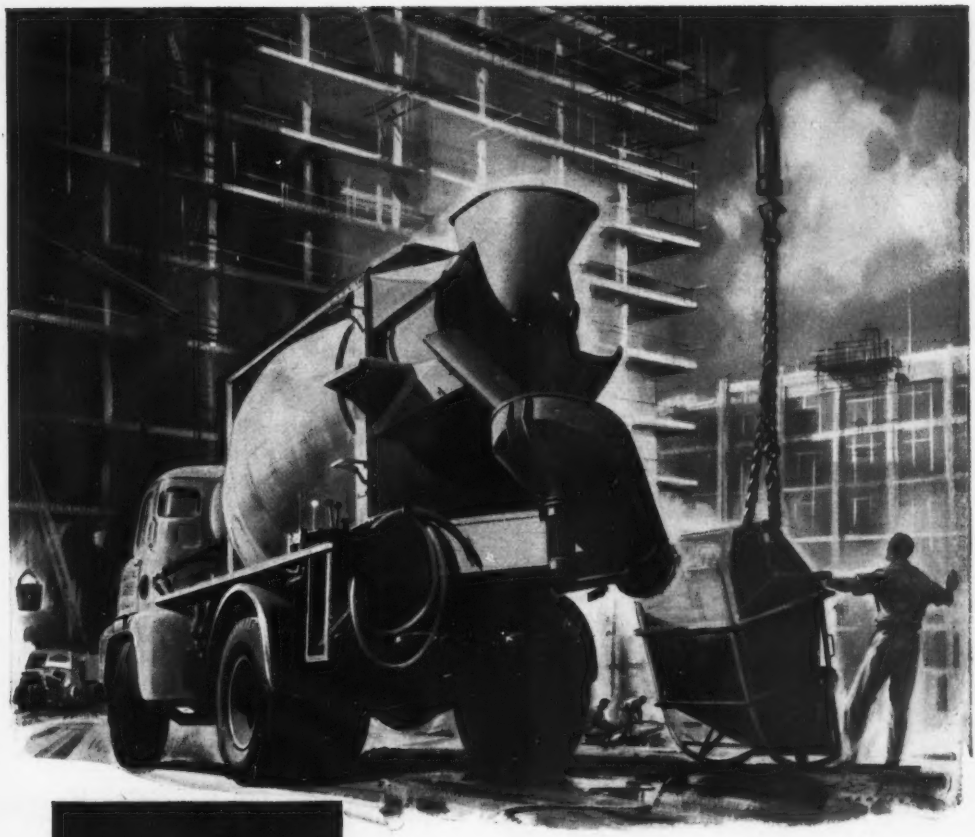

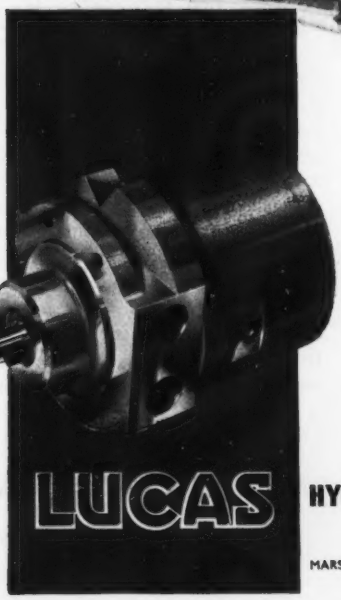

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Britain's civil engineering programme has undergone a major face lift. New techniques speed construction work, bridges, roads and factories take shape overnight.
Lucas hydraulic pumps and motors play a major part in the mechanisation of machinery, such as this concrete mixer.
A typical installation, driving the mixing drum, would be a Lucas IP.1000 variable stroke hydraulic pump driving a Lucas IM.1000 motor.
This system gives the drum an infinitely variable speed, forward and reverse, over a wide range.
A range of pumps and motors is available to meet any application.

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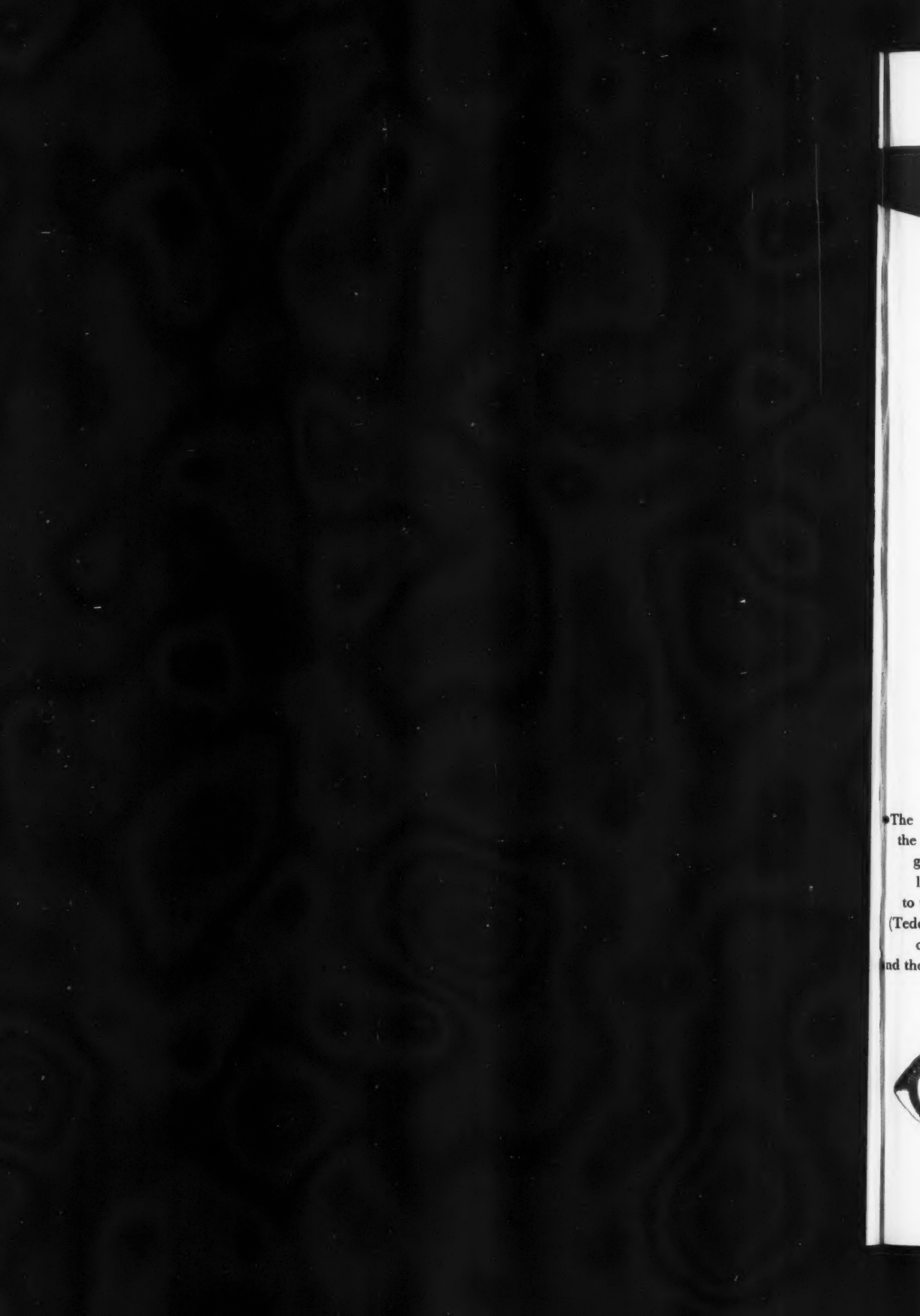

The Universal Measuring Machine

Type MU-214B

Measurements in *three-rectangular co-ordinates* enable workpieces of all types to be checked including internal and external thread gauges.
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The MU-214B is one of several Measuring Machines in the manufacturing programme of Société Genevoise d'Instruments de Physique which also includes:
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Detailed information about SIP Measuring Machines is available from Société Genevoise Ltd., Newport Pagnell, Bucks.
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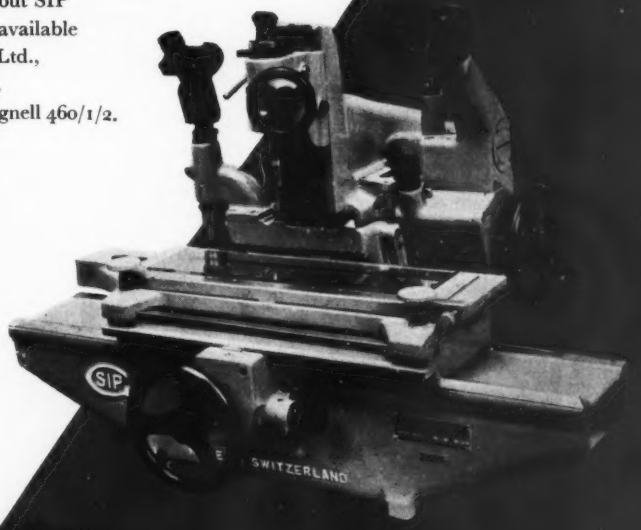

•The Standard Scale is graduated on the same machine and with the same great precision as the fundamental length prototypes supplied by SIP to the National Physical Laboratory (Teddington), the International Office of Weights and Measures (Sèvres) and the National Bureau of Standards (Washington.)

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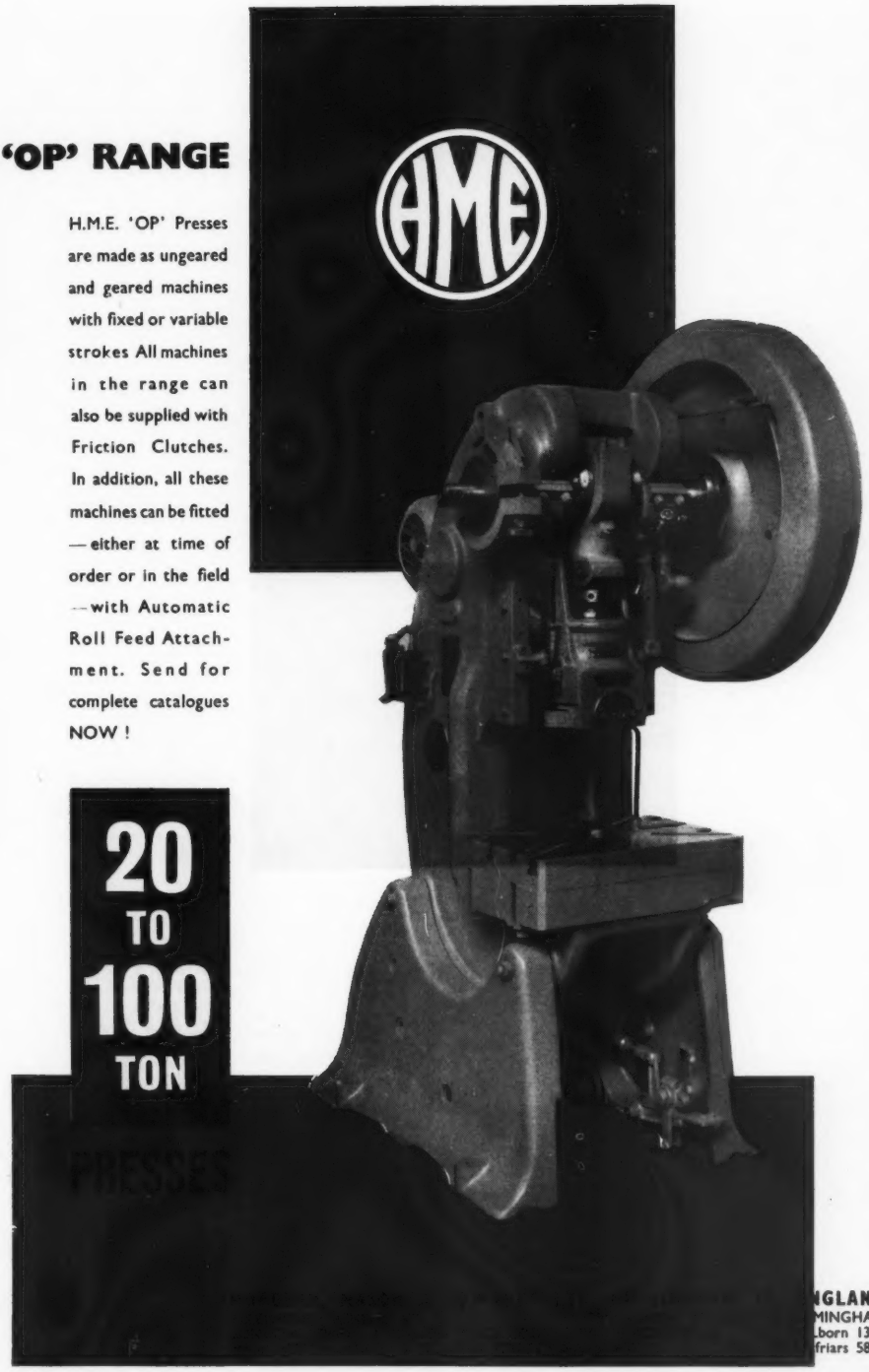

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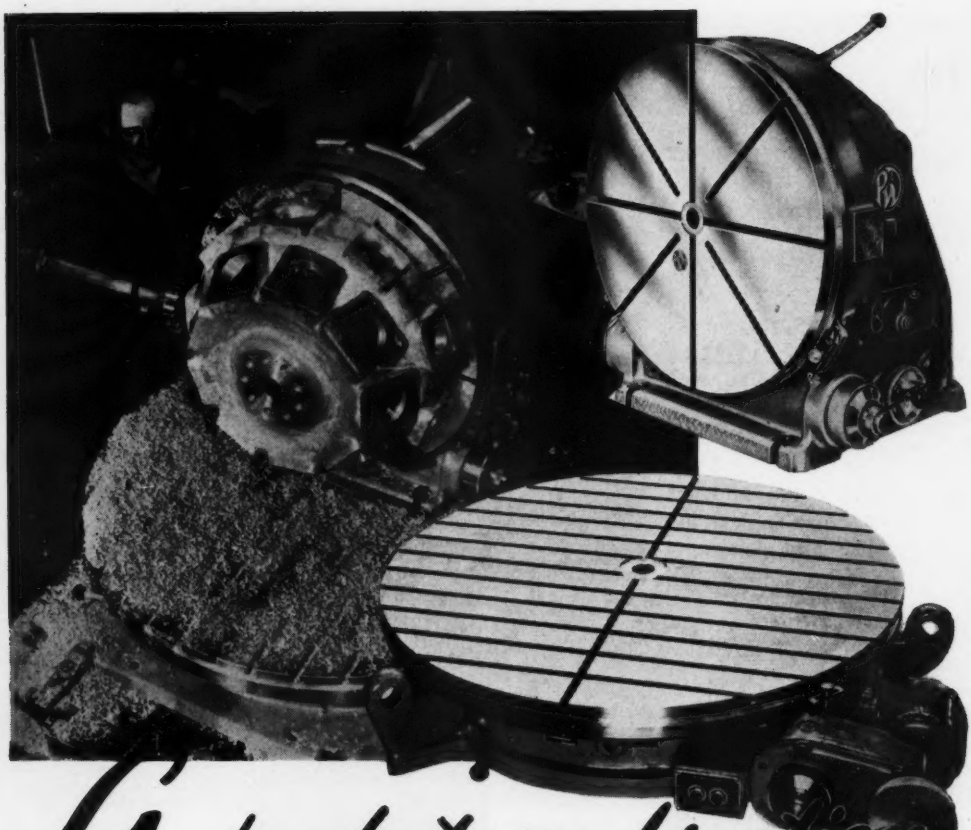

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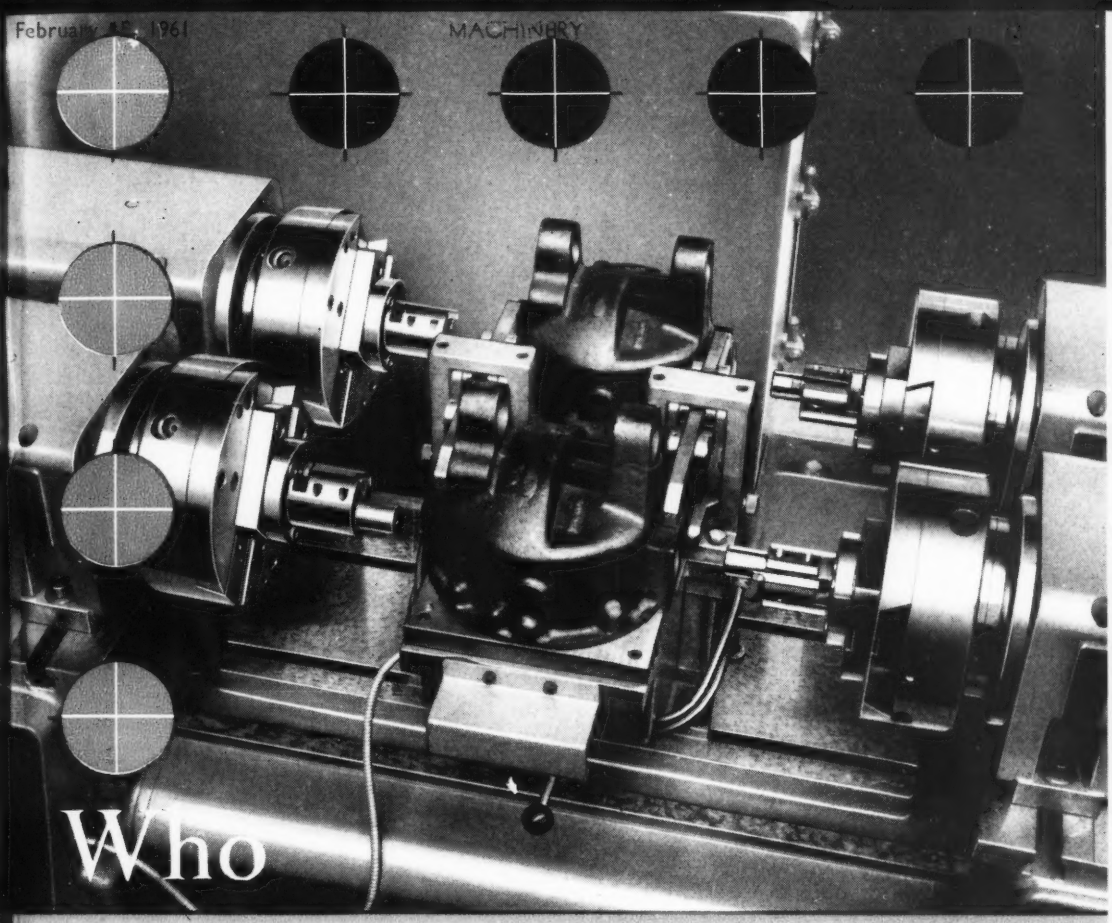
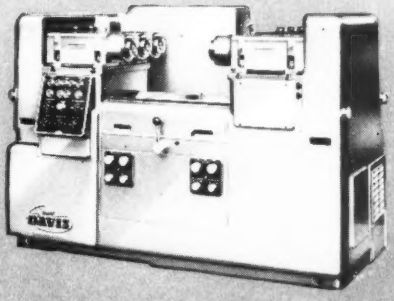


Who puts accurate space into holes?

Stuart Davis do with their range of British designed and British made Fine Borers. Many production engineers have seen the wisdom of producing holes accurate to size and geometry on specialist machines — Fine Borers — instead of wasting time struggling to achieve the impossible on Capstans or Autos. Fine boring and turning is one process which produces holes, external diameters and faces to very close dimensional accuracy at really extraordinary speeds. A Fine Borer needs to be reliable in its feed rates, fast in responding to programme signals, versatile, and of course, consistently accurate in production. That is why many leading companies throughout the world have changed to Stuart Davis Fine Borers, a fitting tribute to British skill in design and manufacturing. The tooling illustrated produces rear axle casings boring to depth and generating inner and outer facings in a cycle time of 2 minutes.



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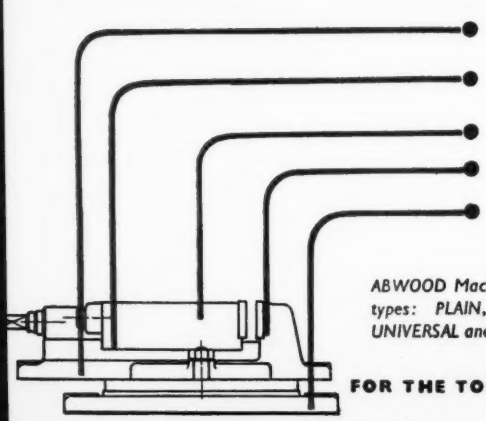

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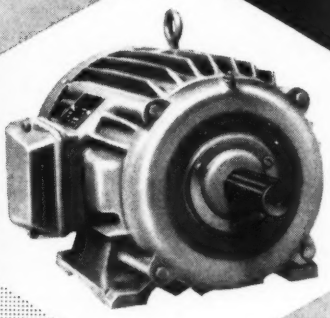

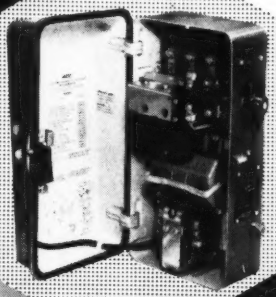

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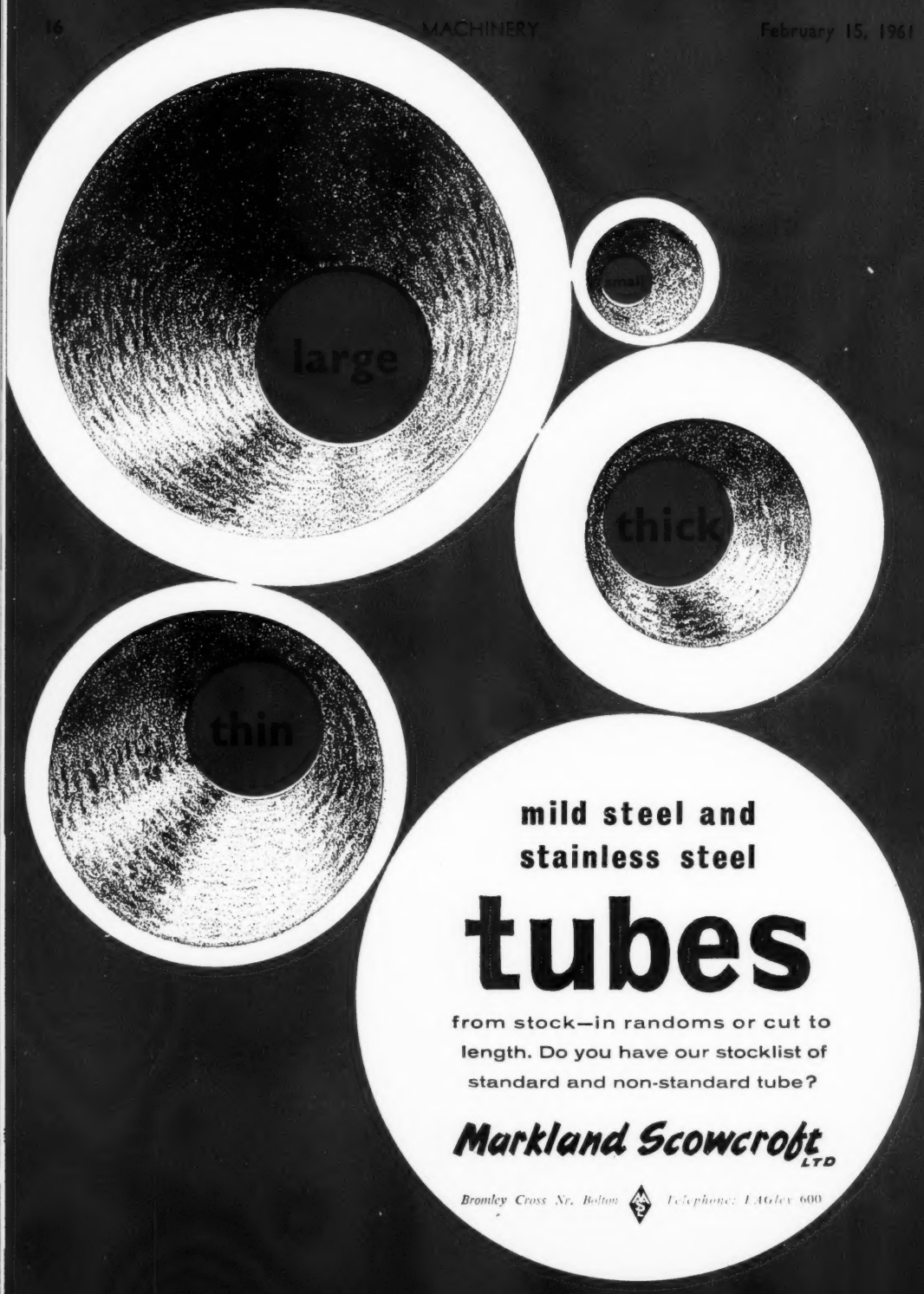

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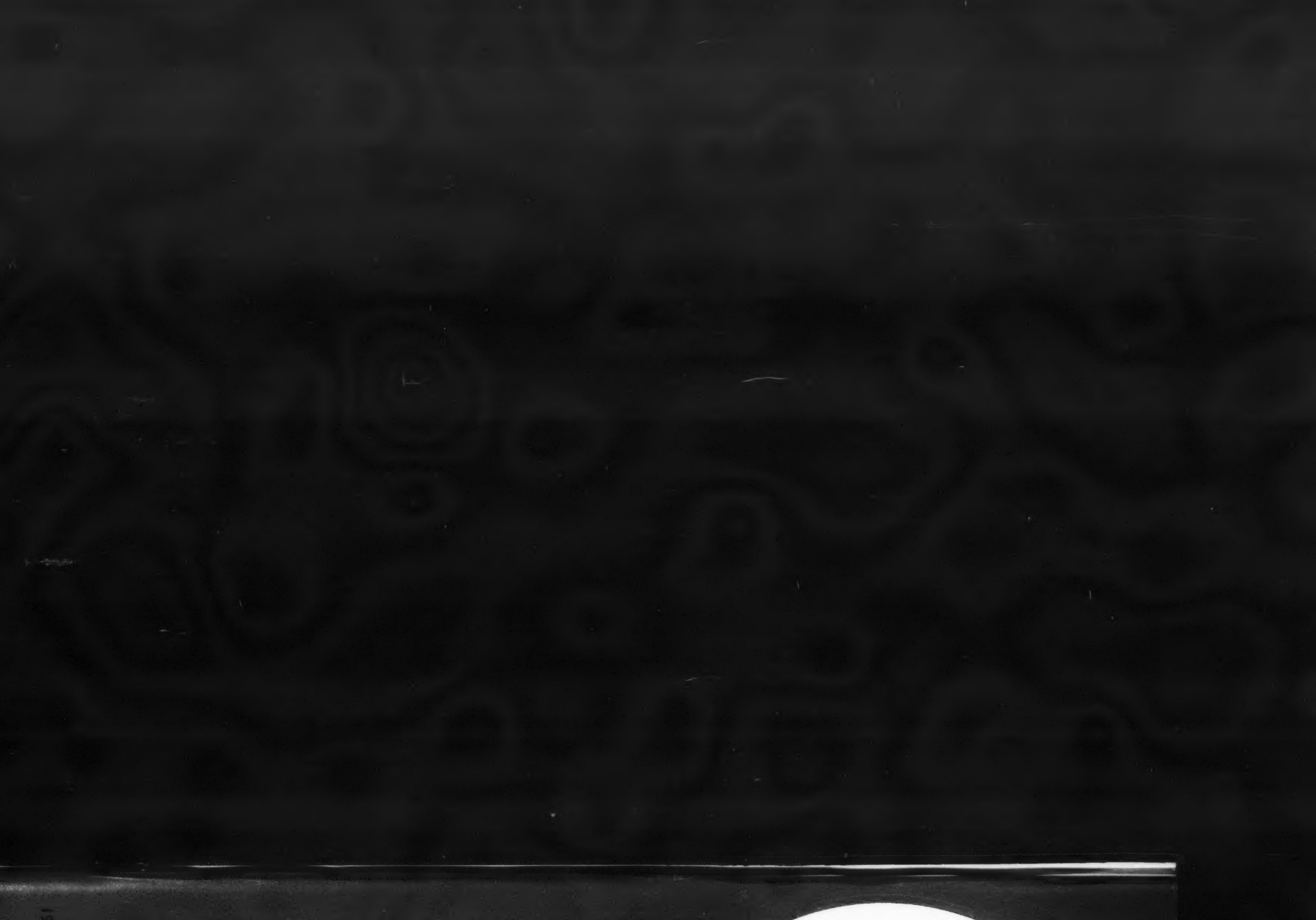

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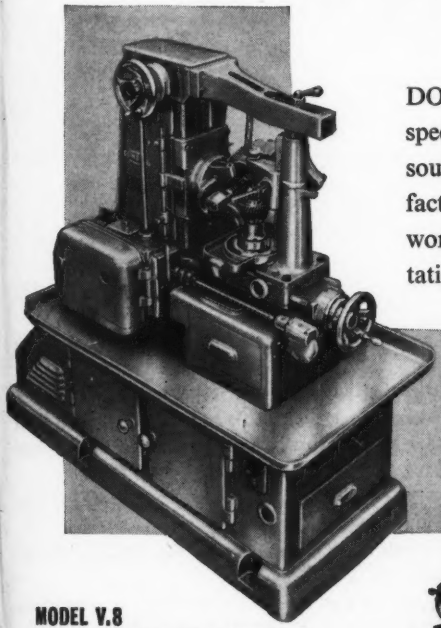

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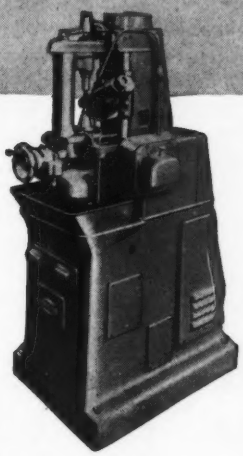
Accurate, versatile, economical. With built-in differential. For spurs, helicals, wormwheels, and worms. Tangential feed and cam operated plunge feed are optional extras. Maximum dia. 8", 7" Face. 12 D.P.



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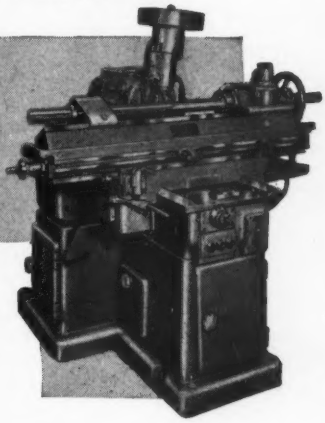
Up to 4" Diameter, 4" face, 20 D.P.



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Powerful and rigid. With built-in differential. For long splines and gears integral with long shafts, and parallel and taper serrations. Alternative heavy duty or high helix angle hob heads. Maximum dia. 7". Hobbing length 18". 8 D.P.

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"We did at first but found it was entirely our own fault through using the wrong types of grinding wheel."

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"No trouble on the REISHAUER—as a matter of fact we've ground master gears on the machine."

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"When you get the combination of coarsest D.P. and greatest helix angle do you get trouble with the grinding wheel producing the correct result?"

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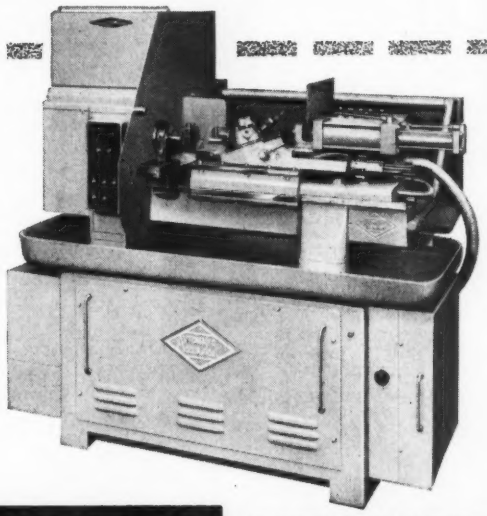

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HIGH SPEED PRECISION CAPSTAN
13/16" bar capacity

With automatic control, this new model combines versatility with rapid, consistent output. Simple to set, slide movements *and* speed and feed values are selected by means of plug-in electrical connections on the NICKOLS Sequence Control unit. The set-up can be changed quickly from continuous cycle for bar work to single cycle for chuck work. Movements can be programmed to take place simultaneously, in sequence or in overlapping sequence. By linking sockets, movements can be kept in operation as long as necessary and time delays can be introduced on any step to provide tool dwell.

Bar capacity $\frac{13}{16}$". *Centre height* $5\frac{1}{4}$".
Turret slide stroke 3". *Spindle speeds 37 to 3000 r.p.m.*

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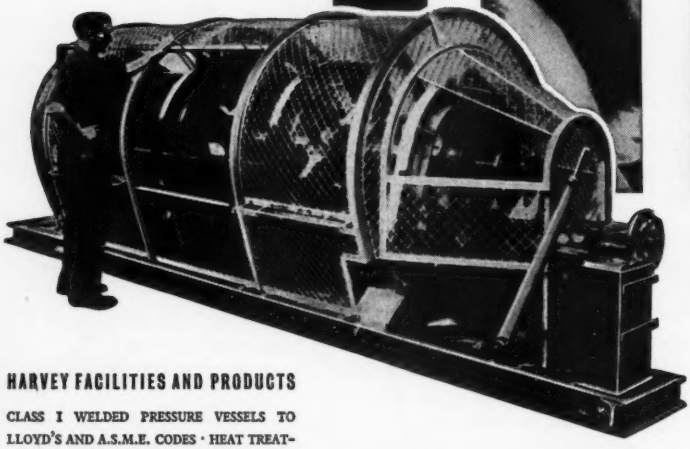
Everybody understands why dangerous animals have to be kept behind bars, and so instances of people being injured by caged wild animals are fortunately rare.

Moving machinery and tools can also inflict serious injury, and it is no less important that these, too, should be securely guarded and fenced.



Safety First with

'HARCO' MACHINERY GUARDS

'Harco' Machinery Guards are purpose made for every type of machinery, and are constructed to afford complete protection without interfering with efficient operation. They are strongly made from stout wire mesh to withstand vibration and rough treatment, and all 'Harco' Guards fully conform to Factory Act requirements. The complete Harvey service covers advice, design and installation, and List No. 996 shows many types already supplied.

HARVEY FACILITIES AND PRODUCTS

CLASS I WELDED PRESSURE VESSELS TO LLOYD'S AND A.S.M.E. CODES · HEAT TREATMENT AND RADIOGRAPHY · 'ROTARPREST' HEADS FROM 5 FT. TO 15 FT. DIA.—*Larger sizes to specification* · WELDED PRESSURE VESSELS AND FABRICATIONS IN ALL METALS STEEL PLATE AND SHEET METALWORK HEAVY MACHINING AND FITTING PERFORATED METALS WOVEN WIRE WIREWORK STEEL STORAGE EQUIPMENT

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G. A. HARVEY & CO. (LONDON) LTD., WOOLWICH ROAD, LONDON, S.E.7

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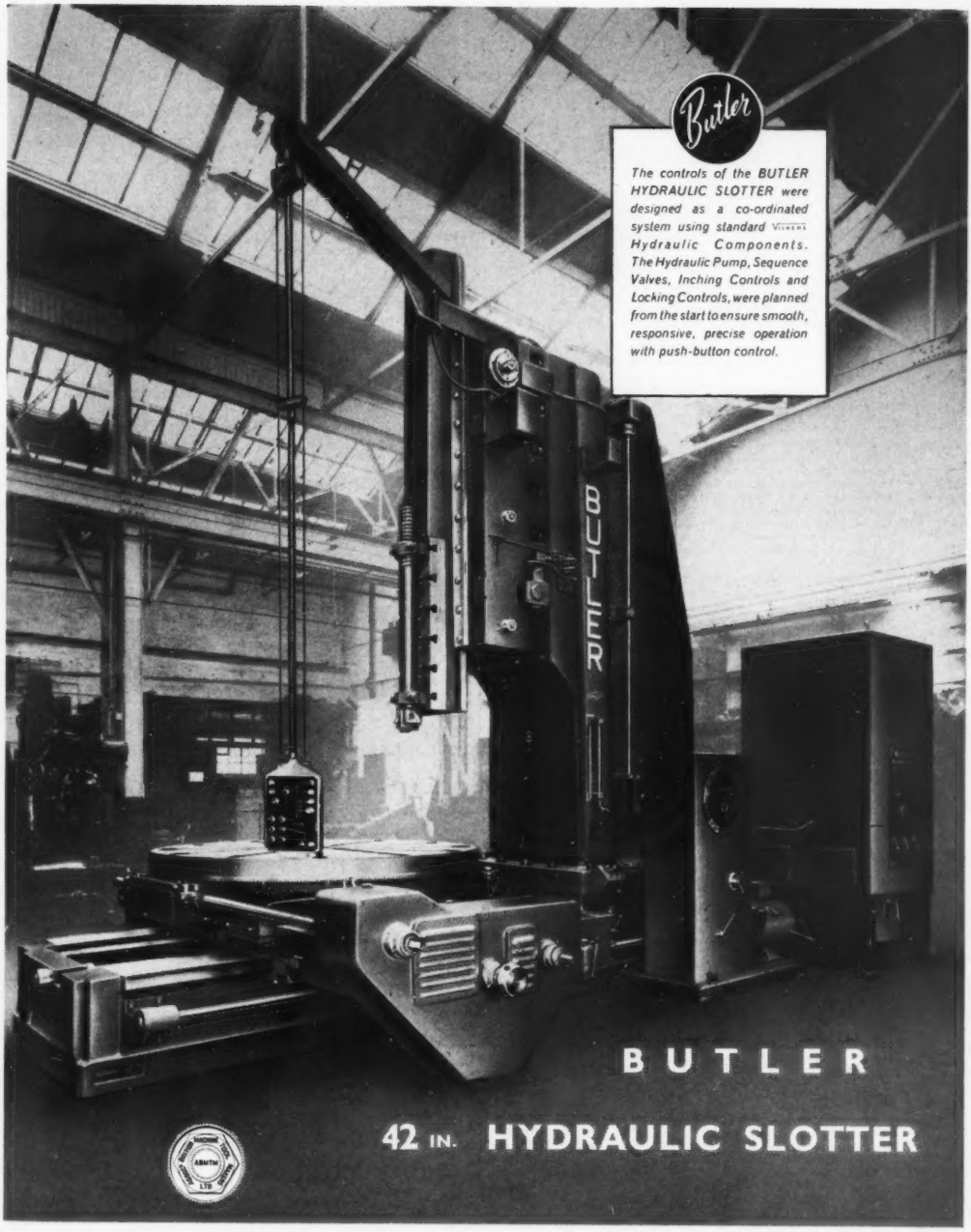

Butler
The controls of the BUTLER HYDRAULIC SLOTTER were designed as a co-ordinated system using standard Vickers Hydraulic Components. The Hydraulic Pump, Sequence Valves, Inching Controls and Locking Controls, were planned from the start to ensure smooth, responsive, precise operation with push-button control.
BUTLER
BUTLER
42 IN. HYDRAULIC SLOTTER

The BUTLER MACHINE TOOL Co LTD
HALIFAX
ENGLAND
TELEPHONE 61641

FOR PLANING SHAPING AND SLOTTING MACHINES

B330

LANG

SURFACING & BORING LATHES
model 26CB

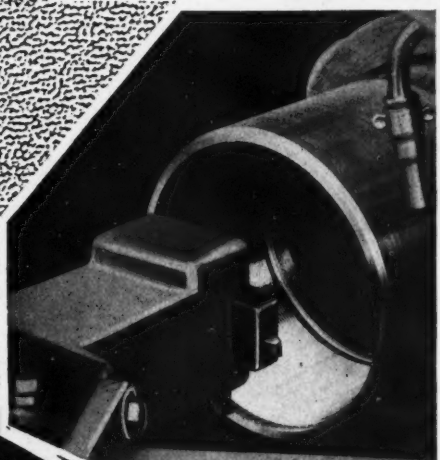
modern design and powerful rigid construction

STANDARD EQUIPMENT

Hexagon turret and slide.
Set of tool holders comprising:
1–Single-tool angular type.
2–Three-tool type.
1–Four-tool type.
1–No. 4 morse drill socket.
1–Sample boring bar.
Independent 4 jaw chuck.
Chuck guard.
Chip tray.
Chip guard at rear of lathe.
Automatic stops for surfacing feeds.
Foundation bolts, levelling screws, plates and wedges.

FEATURES

The bed is angled toward the rear for easy chip dispersal and the bed slideways are completely covered by a stainless steel guard.
Three high precision pre-loaded Gamet taper roller bearings support the spindle giving maximum rigidity under cutting loads.
Direct reading dials for cutting speeds, 24 spindle speeds and 60 feeds.
Clutches and brake are hydraulically actuated and do not require adjustment for wear.
Automatic lubrication to fasthead, gear-box, apron and bedways.
Hardened strips under the saddle to minimise bed-wear.
Removable centre stop on saddle allows the turret to move beyond the centre of the lathe, making possible the use of maximum size boring bars.
Turret location by long rectangular plunger. Location face at maximum radius ensuring very accurate indexing.
The turret will repeat to ·0008" (0·02 mm) at the end of a 8" (203 mm) long bar.
The turret can be supplied completely tooled up to suit clients requirements.



Screwing A.P.I. Round Form Internal 8 Threads per inch. 9½" taper bore.

Swing over bed	32"	813 mm.
Swing over saddle	16"	406 mm.
Admits in front of chuck: with minimum bed length	26"	660 mm.
with maximum bed length	44"	1118 mm.
Hole in spindle	4"	102 mm.
Diameter of chuck	24"	610 mm.
24 spindle speeds (forward and reverse)	6·5 to 684 r.p.m.	6·5 to 684 r/m.
60 longitudinal and surfacing normal feeds	·105" to ·0017"	2·67 to ·044 mm.
60 fine feeds at ·8 highest spindle speeds	·033" to ·0005"	·84 to ·014 mm.

Diameter of spindle flange (British Standard)	14½"	362 mm.
Travel of cross slide	17"	432 mm.
Holes in turret	2½"	63 mm.
Size across turret flats	14"	356 mm.
Tool section	1" × 1½"	25 × 38 mm.
Horsepower required	20	15 Kw.
Net weight (minimum bed length)	95 cwt.	4826 Kg.
Nett weight (maximum bed length)	105 cwt.	5334 Kg.

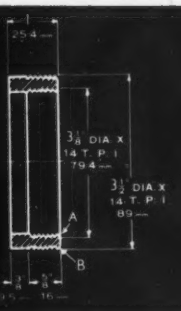
JOHN LANG & SONS LTD.
JOHNSTONE RENFREWSHIRE SCOTLAND
Telephone: Johnstone 400 Telegrams: "Lang Johnstone"

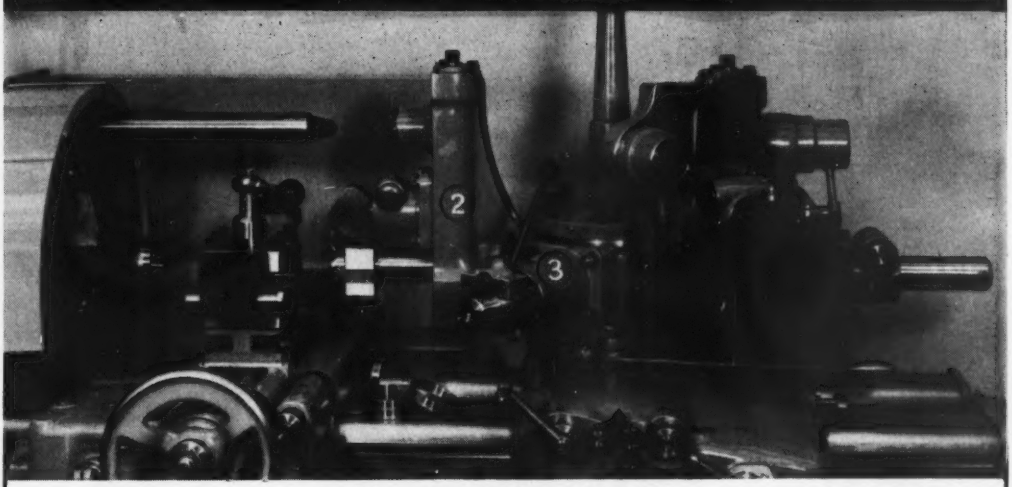
LONDON OFFICE
ASSOCIATED BRITISH MACHINE TOOL MAKERS LIMITED
17 GROSVENOR GARDENS SW1

L226M

Ward SPECIAL

TOOLING LAYOUT No. 15





SCREWED RING

Machined all over.

Floor to Floor Time :

1 min. 45 secs.

No. 7 TURRET LATHE

Code Word : **COVHYRO (SP)**

Special Headstock with Spindle having 4⅝" dia. Bore and Fitted with 15" — 3-Jaw Tudor Chuck.

STEEL TUBE

All Tungsten Carbide Cutting Tools.

Note :— Time for cutting external and internal threads simultaneously (7 cuts) 25 seconds.

DESCRIPTION OF OPERATION	Tool position		Spindle Speed R.P.M.	Max. Cutting Speed		Feed	
	Hex. Turret	Cross-slide		Feet per min.	Metres per min.	Cuts per inch	m/m. per rev.
1. Feed tube to stop and close chuck	1	—	—	—	—	—	—
2. Knee turn 3½" dia., bore, face end and chamfer "A" and "B"	2	—	683	627	191	134	·19
3. Back chamfer bore	3	—	683	560	170	Hand	Hand
4. Cut threads 3½" and 3⅛" dias. × 14 t.p.i. Whit. form, right hand (7 cuts)	—	S.T.1	683	627	191	—	—
5. Part off	—	S.T.2	683	627	191	Hand	Hand

'PRELECTOR' Combination Turret Lathes with Preselective speed-changing.

TURRET LATHES with capacities up to 35 in. swing over bed

1¼ in. to 2¼ in. 'D-S' DOUBLE-SLIDE' Capstan Lathes for heavier accurate work.

Stock Tools, Toolholders, Chucks and Accessories for Capstan and Turret Lathes.

H. W. WARD & CO LTD

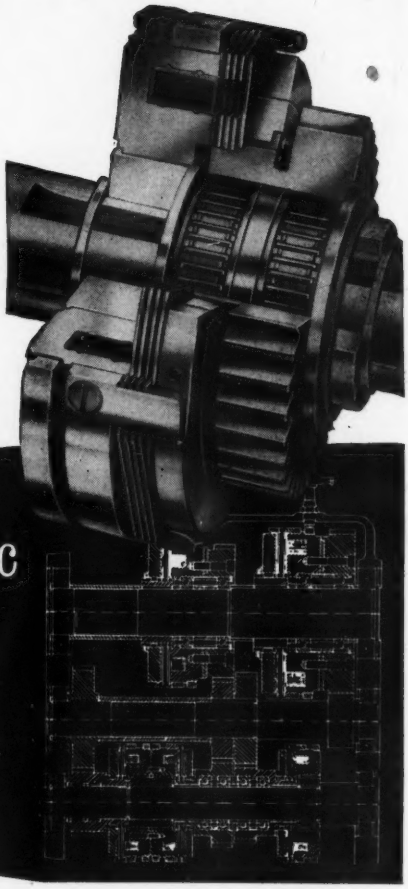
SELLY OAK, BIRMINGHAM 29

Phone : Selly Oak 1131

BRITISH MACHINE TOOL MAKERS ASSOC. ABMTM LTD

W.688

for stop . . .
go . . .
fast . . .
s-l-o-w
machining



Electromagnetic Multiple Disc CLUTCHES

cut non-productive time to a minimum

Electromagnetic Multiple Disc Clutches have proved their efficiency and reliability on a wide variety of machines. Time loss is minimised during changeover stops. Work spindle speed can be varied over a wide range at constant power. Ratios of feed-drive speed to rapid-motion speed in excess of 1:50 are easily obtained.

These Clutches facilitate special production such as automatic machining of a wide variety of work-pieces.

These advantages mean much to the user

- **Unit unaffected by oil.**
- **No adjustment required at any time.**
- **Small dimensions at high torques.**
- **Low energy consumption through efficient flux utilization.**
- **For torque transmission over very wide range.**

Our Electromagnetic Multiple Disc Clutches are available in various designs.

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Telephone: ISLeworth 2311
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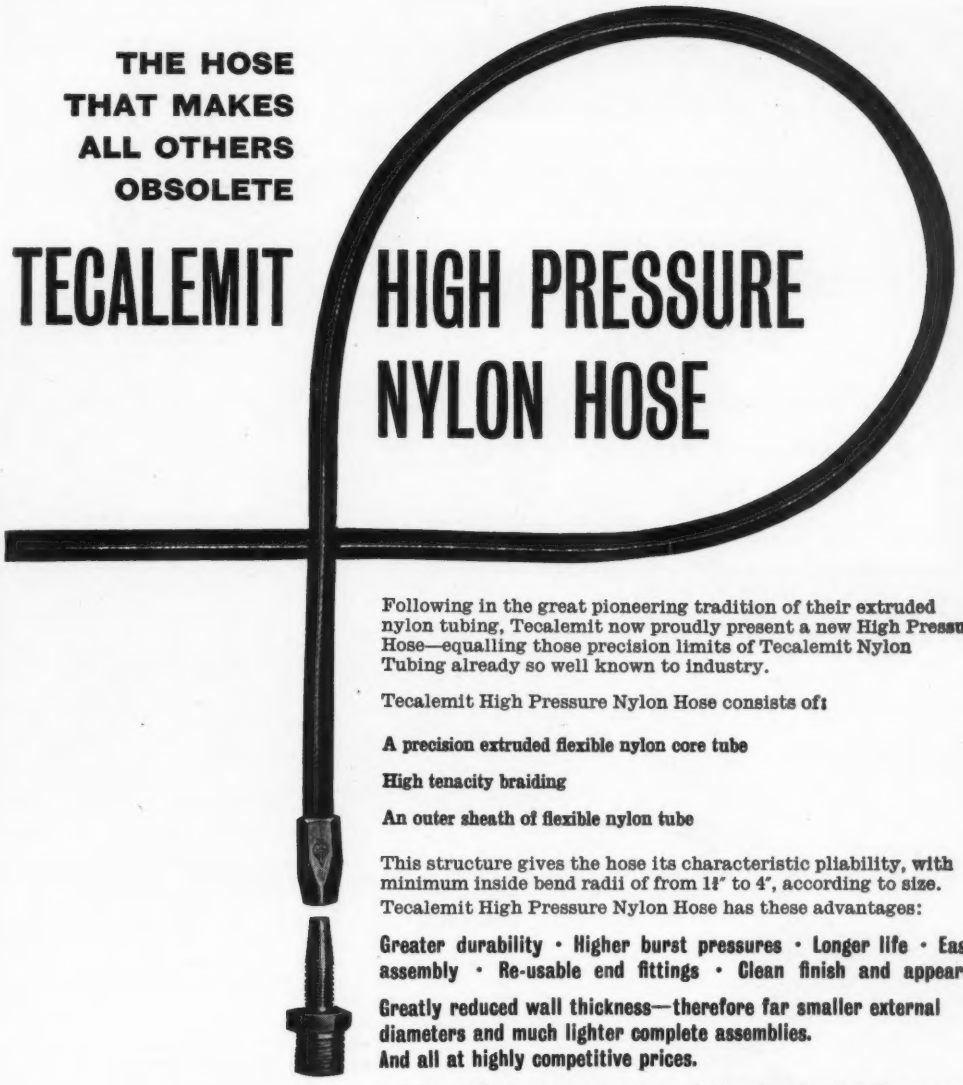
Smee's SIX

THE HOSE THAT MAKES ALL OTHERS OBSOLETE

TECALEMIT HIGH PRESSURE NYLON HOSE



Following in the great pioneering tradition of their extruded nylon tubing, Tecalemit now proudly present a new High Pressure Hose—equalling those precision limits of Tecalemit Nylon Tubing already so well known to industry.

Tecalemit High Pressure Nylon Hose consists of:

A precision extruded flexible nylon core tube

High tenacity braiding

An outer sheath of flexible nylon tube

This structure gives the hose its characteristic pliability, with minimum inside bend radii of from 1¼" to 4", according to size.

Tecalemit High Pressure Nylon Hose has these advantages:

Greater durability • Higher burst pressures • Longer life • Ease of assembly • Re-usable end fittings • Clean finish and appearance

Greatly reduced wall thickness—therefore far smaller external diameters and much lighter complete assemblies.
And all at highly competitive prices.

If you wish to substantiate these claims, Tecalemit will provide sample standard lengths of hose assembled with common forms of coupling, so that test rigs can be undertaken.

Tecalemit High Pressure Hose is supplied in three sizes, ¼", ⅜" and ½" internal diameter, to meet the needs of industry for hydraulic and pneumatic systems.

Write for full technical details of Tecalemit High Pressure Nylon Hoses and their use on hydraulic and pneumatic systems for:—

Agricultural Machinery • Earth-moving Plant
Mechanical Handling Plant • Machine Tools

TECALEMIT LIMITED (SALES MY) PLYMOUTH DEVON T700

When answering advertisements kindly mention MACHINERY.

Now!

HYPROFILE

360° UNIVERSAL

HYDRAULIC ROTARY COPYING

for Internal and External Profiles from Templates

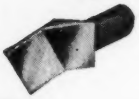
This illustration is the subject matter of British and Foreign Patents.

360° single point tool contouring provides the most economical method of producing moulds, punches, drawing dies, diecasting dies and metal cores.

360° extrapolation and interpolation can also be used on milling machines and centre lathes for producing three-dimensional shapes, internal or external contours from two or more templates. Illustration above shows an elliptical drawing die being produced by the extrapolation of two templates.

Ask for fully descriptive catalogue.

ROUND TO ELLIPTICAL METAL CORE



SQ. WITH 45° HELIX PUNCH

DRAWING DIE WITH TAPERED CONTOUR

PARALLEL CONTOUR BORE

DRAWING DIE

GLASS MOULD

SQ. TO ELLIPTICAL PUNCH

SQ. TO ROUND PLUNGER

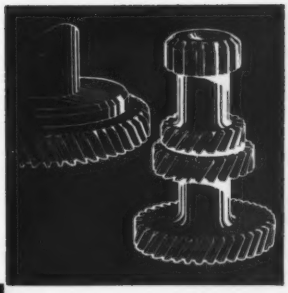
ARMYTAGE (TOOLS) LTD

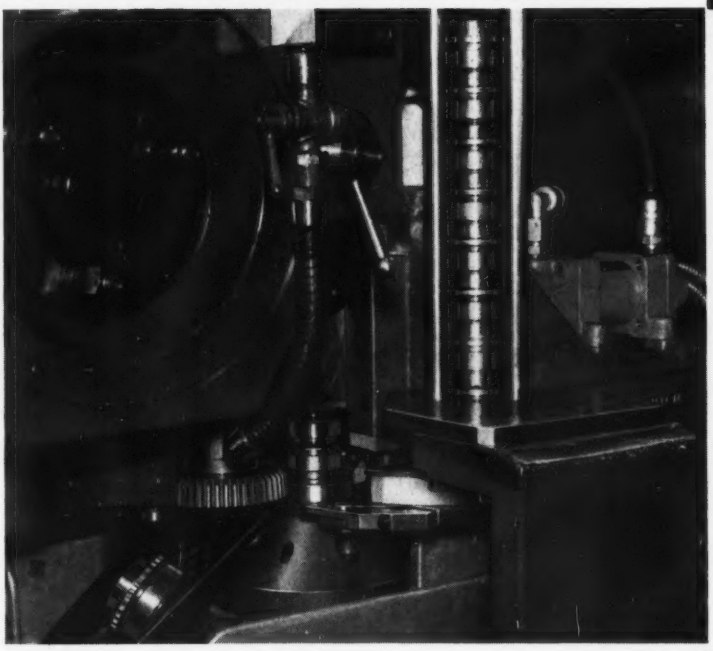
FOUNDRY LANE · KNOTTINGLEY · YORKSHIRE · Tel: Knottingley 2743/4

high-speed shaping of spur and helical gears on the British-made

FELLOWS-ENGLAND

TYPE 7125A GEAR SHAPER





SPUR GEARS

External up to 10" P.D. at 6 D.P.
Internal up to 6" P.D. at 6 D.P.

HELICAL GEARS

External up to 7" P.D. at 6 D.P.
Internal up to 6" P.D. at 6 D.P.
Helix Angles from 5° to 45°

RANGE OF CUTTING SPEEDS

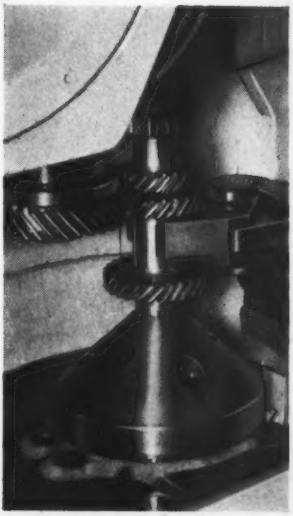
6 speeds from 156 to 515 strokes per min.

CUTTER FEEDS PER STROKE

Eight feeds from ·006" to ·0013" per inch dia. of cutter

A fully-automatic cycle can now be obtained on the Fellows-England Type 7125A Gear Shaper, for suitable gears. Repetitive accuracy in locating and clamping, is assured.

The above illustration shows the principle applied to cutting a 30T, 12 D.P. 0·16" face width, spur gear whilst alongside, a layshaft cluster gear, the 2nd speed gear of which is cut in a cycle time of 3 minutes 4 seconds. The latter employs a transfer arm which loads and unloads from a conveyor which is part of a 27-station in-line transfer machine.



The Fellows-England Type 6 A.H. Gear Shaper, cuts gears up to 20" (external), and 8" (internal) pitch diameter, up to 3/4 (spur) 4/5 (helical) D.P., maximum face width 5".

The PATENTED FEED CAM TRIP MECHANISM fitted to Fellows-England Machines allows accurate control of cutter over-run to avoid dropped-tooth.

ALFRED HERBERT LTD., COVENTRY

AD 620

Can you

SHARPEN SWIFTLY AND ACCURATELY, COMPLICATED TOOLS SUCH AS THESE?

You can

— ON THE

CHRISTEN-AMIET

DRILL GRINDING MACHINE

MODEL 2-32

(COMPLETE WITH CENTRING MICROSCOPE)

As well as other tools from standard twist drills to engraving needles

CAPACITY

Drills with cylindrical shank — $\frac{3}{32}$" - $1\frac{1}{4}$" dia.
Drills with taper shank — Nos. 1, 2 & 3 M.T.

OTHER CHRISTEN-AMIET DRILL GRINDERS

Model 01-2 with grinding range 0.004" - 0.080"
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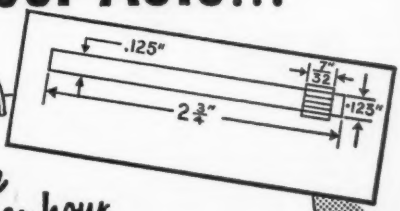
Telephone: VICTORIA 0370 & 5301

79% Production Increase from Your Auto...



Conventional Auto Time 540 per hour

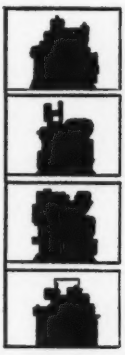
'LIPE' Time 969 per hour!

LIPE
PNEUMATIC

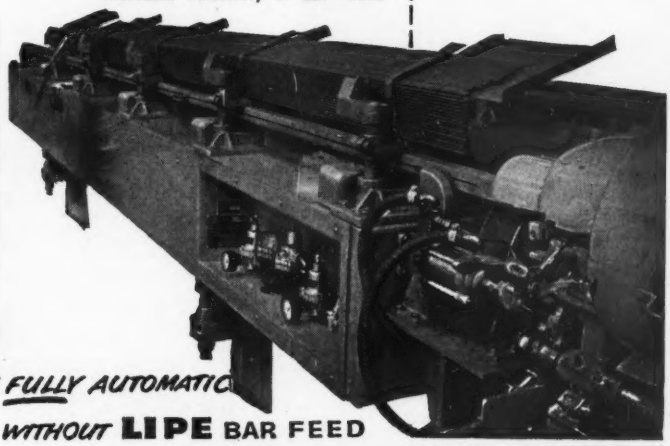
LET US ESTIMATE SAVINGS ON YOUR EXISTING RUN

- Only 4 seconds reloading.
- No idle time, continuous running.
- Proved in use, one operator handles several machines.
- Range covers 1/8in. to 1 1/16in. bar, 1/4in. to 1 1/16in. tube.
- Feeds to last workpiece—without fingers.
- Ejects remnant automatically.
- Patented Rear Ejection gives positive control of remnant at all times, increases versatility of Bar Feed.

AUTOMATIC BAR FEED



THERE'S A **LIPE** *FOR MOST BAR FED MACHINES*



✱ *YOUR AUTO IS NOT FULLY AUTOMATIC WITHOUT* **LIPE** BAR FEED

WRITE FOR LEAFLET to dept. M.2555

Patents Nos. 728898 and 743461, 827417

Automation Ltd.
DEVONSHIRE HOUSE · VICARAGE CRESCENT · LONDON · S.W.11
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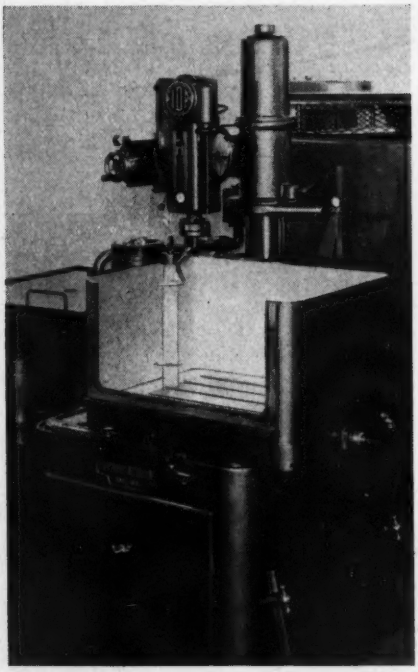
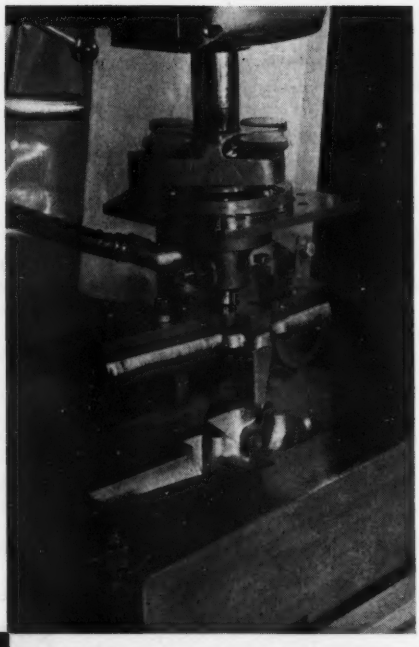
NRP2555

the New

SPARCATRON MARK V



This machine has been introduced for handling workpieces larger than can be conveniently accommodated in the earlier models and has been produced with the forging industry in mind for the production of dies.



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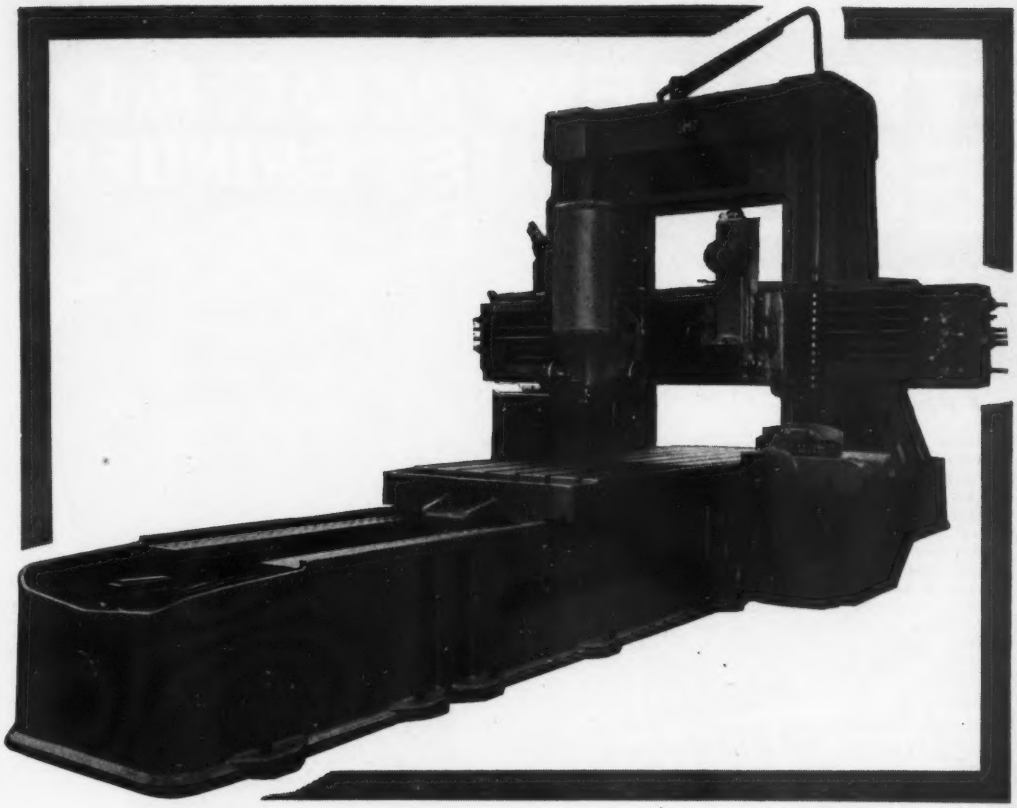
IMPREGNATED DIAMOND PRODUCTS LTD.
OF GLOUCESTER · ENGLAND



CLYDE BUILT SMT GLASGOW MACHINE TOOLS

DOUBLE HOUSING PLANERS

The illustration shows our new design of 4ft. 0in. Machine complete with Milling Head. These machines are made from 3ft. 0in. wide up to the very largest sizes. Openside, rail and horizontal and vertical machines are also available.

The drive of our Planers now incorporates the closed loop system of control, giving an extremely wide range of speeds and greatly improved acceleration and deceleration, with subsequent reduction in cycle times. The very robust construction of the Machine will be noted, enabling full advantage to be taken of the power available and the latest types of cutting tools. The table runs on plastic strips of proved efficiency. Extra long down feed, with individual feed motion to each tool box is a useful feature and push button controlled inching saves setting time.

Our two-speed milling head is a very useful addition to the Machine, which can be supplied when required, and extremely high metal removal rates are possible, using a very advanced, but easily maintained, type of cutter. We are able to offer these heads for attachment to existing Planers, and in these cases we can also supply the feed gear which may be needed. In the case of our new Machines, the planer drive itself can provide suitable speeds and larger Machines have an auxiliary feed gear in the transverse direction. Leaflets are available of the Planing Machines and the Milling Head, and we shall be pleased to send copies of these publications or to submit quotations at your request.

SCOTTISH

MACHINE TOOL CORPORATION LTD.

17 Lynedoch Cresc., Glasgow, C.3.
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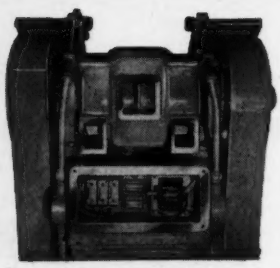
THE NEW MURAD EG8 DUSTLESS GRINDER

- *Filter Resistance Halved*
- *Impeller Capacity Trebled*
- *Eye Shields and Local Lighting*
- *Now Standard*

These are some of the many improvements embodied in the new EG.8 making it without question the best off-hand Grinder in the world. The Murad Dustless Grinder is unique. It embodies its own dust inhibitor which offers protection to both worker and employer and makes the provision of a separate dust extraction plant unnecessary. It can be placed anywhere in the shop to suit the sequence of operations, even in close proximity to precision machines without endangering their slides. The repeat order is the finest tribute that a customer can pay to the efficiency and reliability of a machine tool. Britain's industrial giants have paid this tribute to the Murad Dustless Grinder.

Amongst many Users who send us a constant stream of repeat orders are such world-famous firms as Mullards, Pressed Steel, G.E.C., Atomic Energy Authority, B.T.H., British Oxygen Gillette Industries, Skefko, etc., etc.



Control switchgear is designed into the machine and not added as an afterthought.

The above illustration shows the eyeshield swung up for ease in changing lamps, etc.

Pat. No. 674748

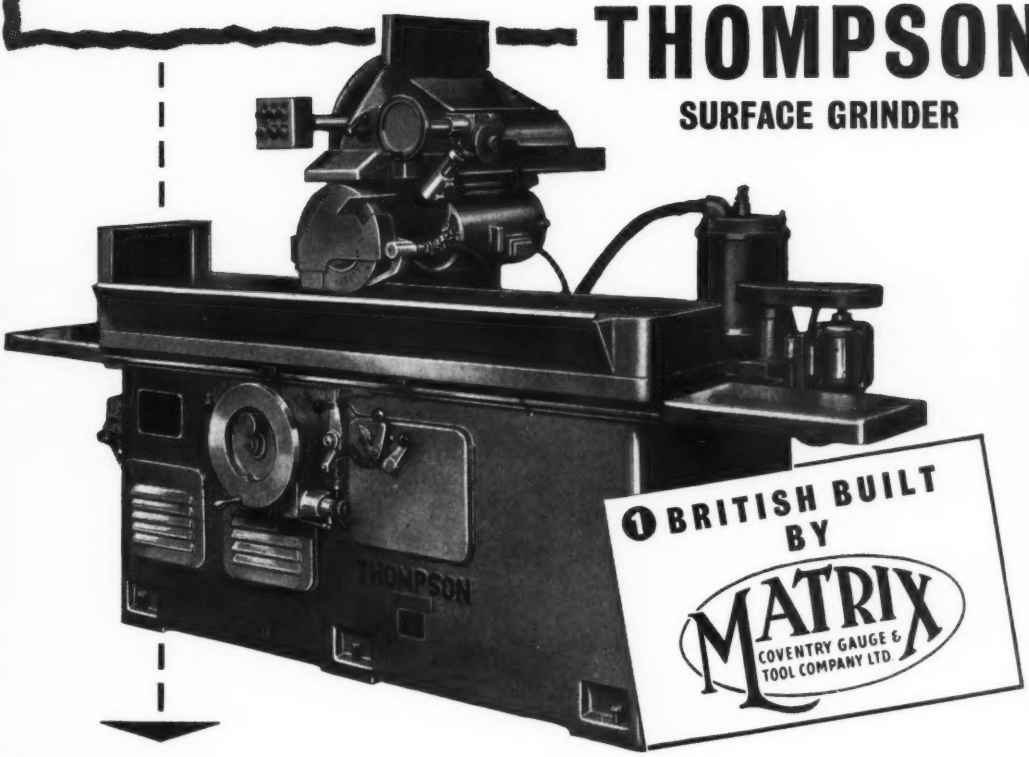
Murad DEVELOPMENTS LTD.

STOCKLAKE – AYLESBURY – BUCKS

TELEPHONE: AYLESBURY 2691 (4 LINES) CABLES: MURADITE, AYLESBURY

961

10 Reasons
why you will now choose a THOMPSON
SURFACE GRINDER



2 **Fitted with the EXCLUSIVE HYDRA-COOL HYDRAULIC SYSTEM for Constant accuracy.**

3 **MAXIMUM RIGIDITY**
Work table runs on Vee and Flat Slide. Extra heavy column, wheelhead on large rectangular ways.

4 **FLAME HARDENED CROSS SLIDE WAYS**
Heavy dove-tail ways are hardened and ground.

5 **AUTOMATIC LUBRICATION**
Filtered oil supply prolongs life of ways.

6 **GRINDING WHEEL SPINDLE MOUNTED IN PRECISION BALL BEARINGS**
ADJUSTABLE BRONZE FRONT SPINDLE BEARING SUPPLIED IF PREFERRED.

7 **MANUAL CROSS FEED**
Standard equipment for accurate shoulder or slot grinding.

8 **REDUCED OPERATOR FATIGUE**
Simplified controls conveniently grouped in operating area for easy operation.

9 **RAPID AND ACCURATE WHEELHEAD POSITIONING**
Hydraulic rapid traverse of wheelhead provided for speedy loading or starting cut.

10 **CROSS FEED WHEELHEAD**
Built-in wheel dresser and hydraulic truing feed to wheel head.

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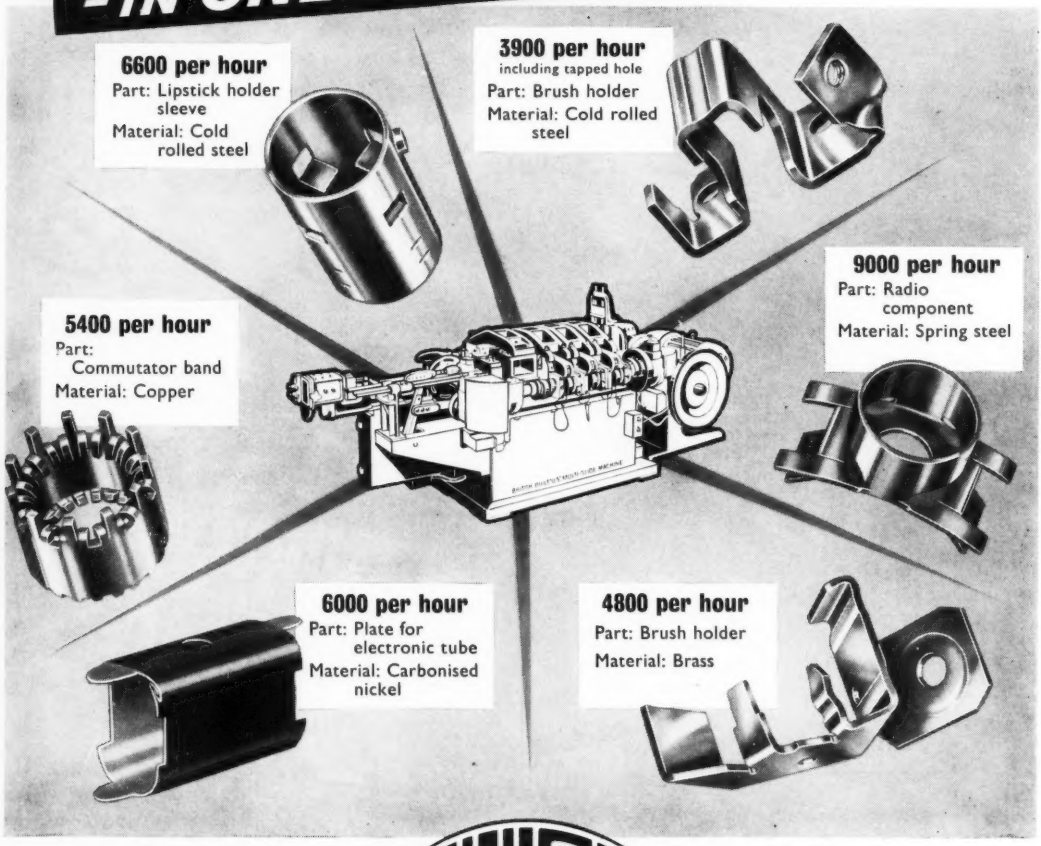
Intricate FORMED STAMPINGS...

-IN ONE OPERATION!



British-built MULTI-SLIDE MACHINES

One "U.S." Multi-Slide Machine has replaced as many as eight separate press operations on the production of a complex part. Two models are available which can be supplied completely tooled for the production of one or more components. If you manufacture formed stampings from material up to 3" wide the "U.S." Multi-Slide Machine offers outstanding reductions in production costs. Substantial material savings, less parts handling, less floor space, are only some of the benefits.
Send us samples or drawings of the stampings you are producing or considering and we will be pleased to submit a detailed quotation.

For further particulars write or telephone TODAY

ROCKWELL
MACHINE TOOL CO. LTD.

WELSH HARP, EDGWARE RD., LONDON, N.W.2. TEL: GLADSTONE 0033

ALSO AT BIRMINGHAM—TEL: SPRINGFIELD 1134/5 · STOCKPORT—TEL: STOCKPORT 5241 · GLASGOW—TEL: MERRYLEE 2822

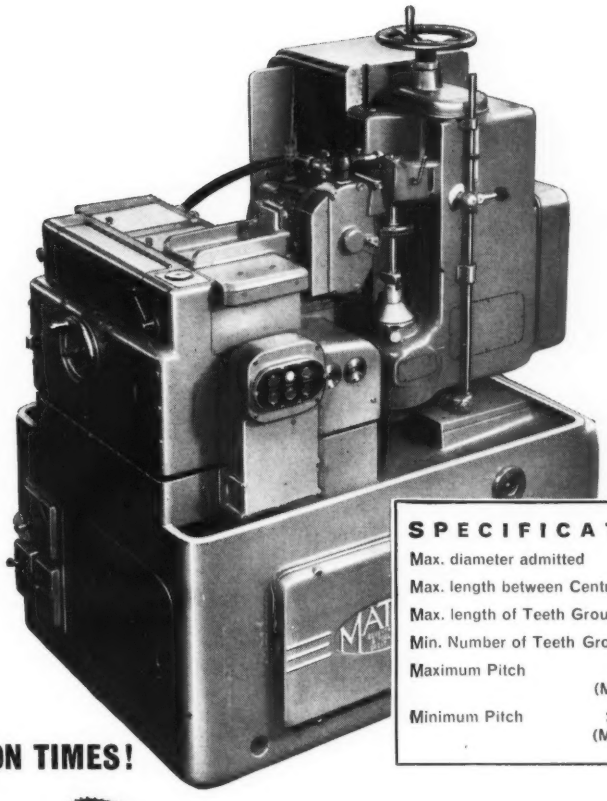
MATRIX QUALITY

GRIND YOUR SMALL SPUR GEARS better and faster than by cutting

GEAR GRINDING MACHINE

NO. 61-6-9

- Gears can be ground from solid hardened blanks overcoming heat treatment distortion problems.
- Gears of suitable dimensions can be mounted in multiples and ground in one operation.
- Generating principle eliminates indexing.
- Gear tooth development is from the basic rack which is formed on the grinding wheel periphery in a continuous helix.
- Any diameter gears of similar pitch can be ground merely by altering the change gears for the number of teeth.
- Built-in wheel crushing unit is semi-automatic, type of pitch being governed by three easily fitted racks and segments.
- For gears of extreme precision, grinding wheel is diamond dressed by unit which is quickly interchanged with crusher.



SPECIFICATION	
Max. diameter admitted	6″
Max. length between Centres	9″
Max. length of Teeth Ground	3″
Min. Number of Teeth Ground	12
Maximum Pitch	16 D.P. (Module 1.6)
Minimum Pitch	200 D.P. (Module 125)

Study these PRODUCTION TIMES!

4½ mins.
40 D.P. 120 Teeth.
3″ P.C.D.

12 secs. each
15 gears ground simultaneously
1.20 Module 40 Teeth.
48 mm. P.C.D.

2½ mins.
48 D.P.
24 Teeth.
0.5″ P.C.D.

For further particulars write or telephone TODAY

ROCKWELL MACHINE TOOL CO. LTD.

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Sperry's dial THIEL 158 for *PRECISION...*

Sperry Gyroscope Co. Ltd., use Thiel 158 Duplex Toolroom millers in the production of magnetic storage drum mantles for G.P.O. automatic telephone exchanges and computers.

Illustration shows a Type 1C mantle in which 434 head mounting holes are bored to a specification which calls for vertical height to be ± 0·0005 in. and radial accuracy to be better than 17 seconds of arc.

THIEL 158

DUPLEX TOOLROOM MILLING MACHINE

Designed for sustained accuracy, extreme versatility, simple operation and long life, this established high-grade toolroom milling machine is now available with rapid traverse to the table and headstock movements. A wide range of equipment is available, the latest additions being a jig boring head with three power feeds, 32″ x 11″ six way swivelling and tilting compound table with 5″ cross movement and a spiral milling attachment for cylindrical and tapered work.

ROCKWELL
MACHINE TOOL CO. LTD.

For further particulars write or telephone TODAY

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Thiel 8

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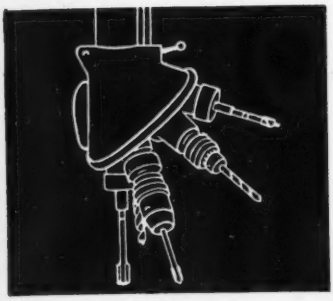
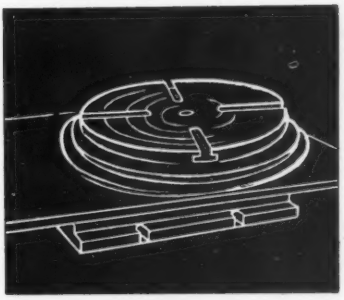
Helping to cut your Drilling Costs



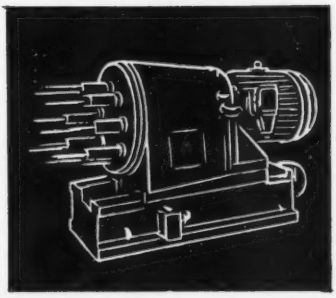
MULTIDRILL AND TAPPING HEADS

with fixed or adjustable spindle centres, for mounting on drilling machines or as self-contained units, with or without automatic feed cycle. Tapping with or without lead screw control.



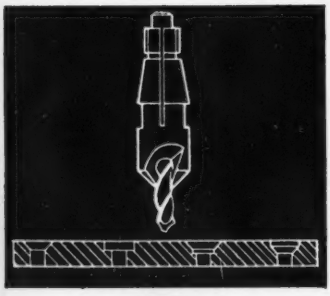
ARBO AUTOMATIC TURRET DRILL HEAD

2-7 stations, choice of 10 speeds and separate depth stop for each station. Tapping by reversing spindles and positive or friction drive. Automatic indexing, $\frac{3}{8}$in. or 1in. drilling capacity.



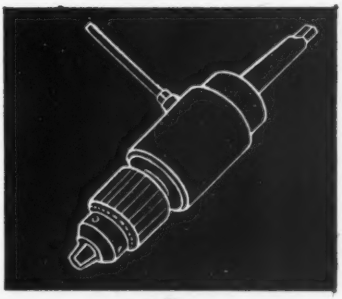
THOKA FLOATING COMPOUND TABLE

saves handling time and jig cost. Floats on air for fingertip positioning, locked by air pressure during drilling. 12in. and 18in. table diameters. Arranged for indexing, can be set quickly to any P.C.D.



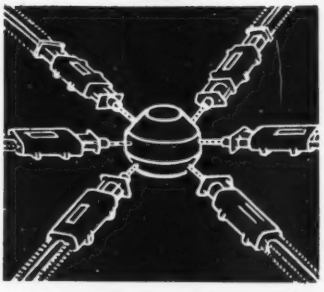
COMMANDER MULTI-ANGLE DRILL UNITS

low priced compact units for special set-ups for drilling at odd angles, re-set rapidly for another job. Flexible shaft drive, self-contained, hydraulic or pneumatic feed system. $\frac{3}{8}$in. dia. capacity, 4in. stroke.



PROCEDO COMBINATION COUNTERSINKERS

do two operations in the time of one. Combined drilling and countersinking, counterboring deburring or trepanning, with ordinary twist drills.



COMMANDER DRILL CHIP BREAKER

drills deeper and more accurate holes at higher speeds, by breaking the chips into small fragments. Fewer broken drills and more holes between re-grinds. $\frac{1}{4}$in. maximum drill size.

THOKA

THOKA MACHINERY SUPPLIES LTD

2 DRAPERS GARDENS · LONDON · E.C.2

'Phone: NATional 7391. Cables: THOKANE, London.

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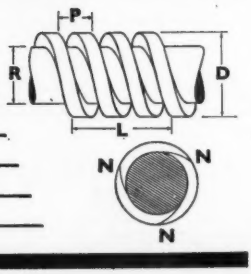
ACTUAL MANUFACTURERS OF PRECISION TRANSMISSION SCREW THREADS ($\frac{5}{8}$" dia. to 10" dia. : up to 30' long according to dia.) AND NUTS —ALSO EXTRUDER SCREWS FOR THE PLASTICS INDUSTRY

The following information will be of assistance when making enquiries:—

TYPE OF THREAD
HAND OF THREAD
PITCH (P)
LEAD (L)
No. OF STARTS (N)
OUTSIDE DIAMETER (D)
ROOT DIAMETER (R)
TYPE OF MATERIAL
PURPOSE



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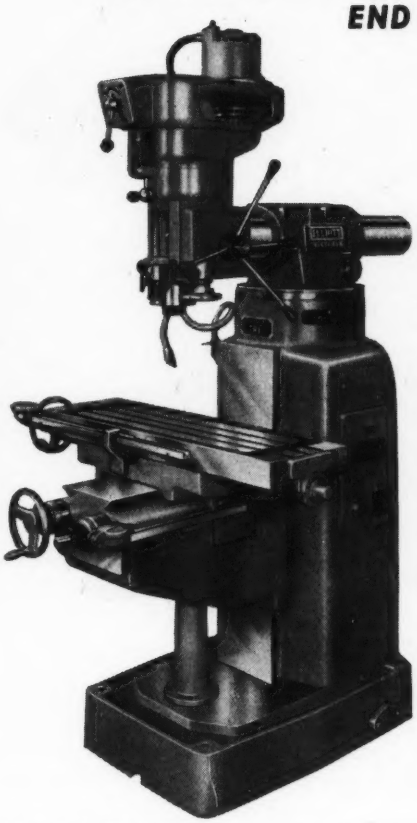
TURRET MILLING MACHINES

for MILLING · DRILLING · BORING · DIE SINKING
END MILLING · KEYWAY CUTTING



Model TR1 ***TABLE SIZE 36" x 10¼"***

5" dia. round overarm, rotated for angular setting of the head.

Rugged base casting, precision ground bearing areas.

Head powered by 1½ h.p. motor.

Model TV2 ***TABLE SIZE 36" x 10¼"***

Similar to model TR1 but fitted with heavier type head, powered by 1½ h.p. motor. Longitudinal power feed unit available as extra equipment.

Send for full data.

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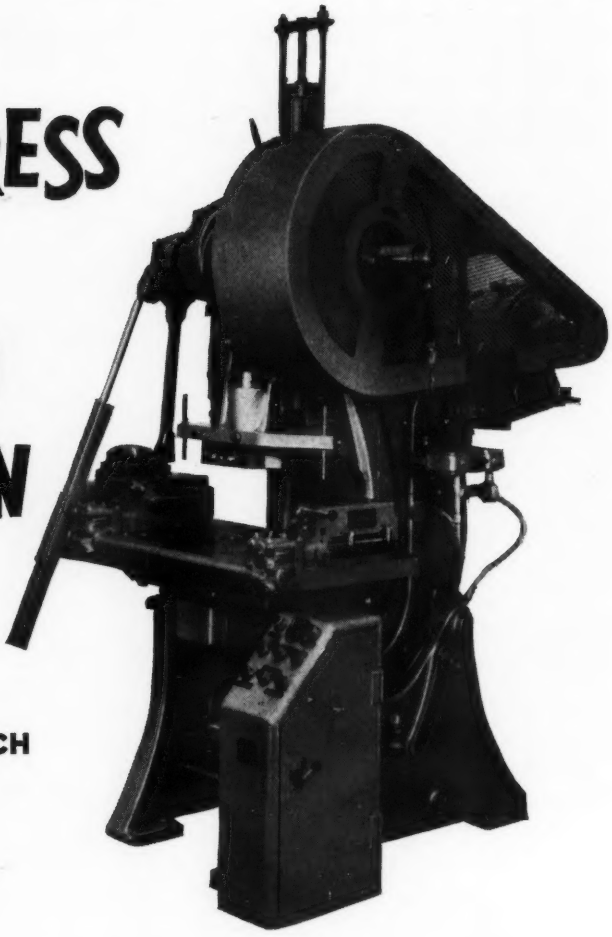
A POWER PRESS for your INCREASED PRODUCTION



HUMPHRIS
New 25 TON
AIR FRICTION CLUTCH
OPEN BACK
INCLINABLE
CRANK PRESS
A. 25 F

An entirely fresh design approach to the problem of providing a reliable high speed press with the simplest possible control arrangement.
The A.25F is a logical development from the earlier CP. 25 range of presses and is the outcome of considerable experience. The clutch, variable speed drive and clutch system are all well proved proprietary items chosen by HUMPHRIS engineers as being the most reliable accessories available today.

pressmaster *the spearhead of development in the pressed metal industry*

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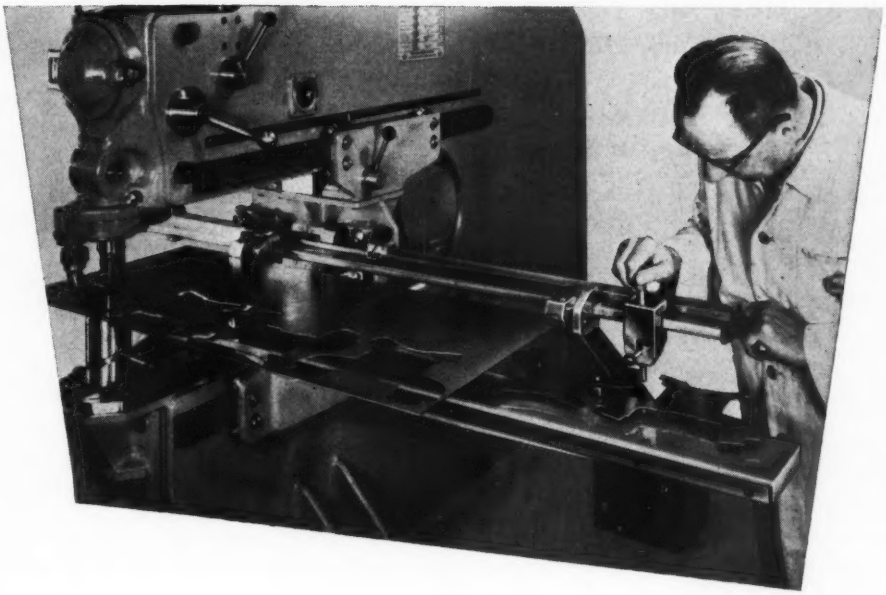
COPY-NIBBLE

all the blanks you can't stamp out



MANY blanking or punching jobs are too costly for press and tools: area too big or too few off, so the ideal method is copy-nibbling to cut internal and external shapes with no extra tools: each one a facsimile of the last — from one master shape. Circular blanks and circular or rectangular cut-outs require no master: just make use of the ingenious system of movement and co-ordinate scales incorporated in the machines. Three Trumpf models to cut up to 0·16in. thick (32 tons tensile) and up to 23½in. diameter.

Fuller details from U.K. agents can save you worry and expense

Excellent terms, monthly account, hire purchase, or The F J E Machine Hire Plan

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8¾" dia. £65 . 0 . 0

12" dia. £78 . 10 . 0

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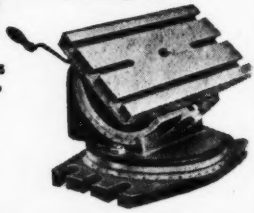
These Swivel Angle Units can also be supplied with 3 Jaw Chucks, Vices and Dividing Heads



Rectangular Tables

Size 1 5 5/16" x 10¼"

£57 . 10 . 0

Size 2 7" x 14"

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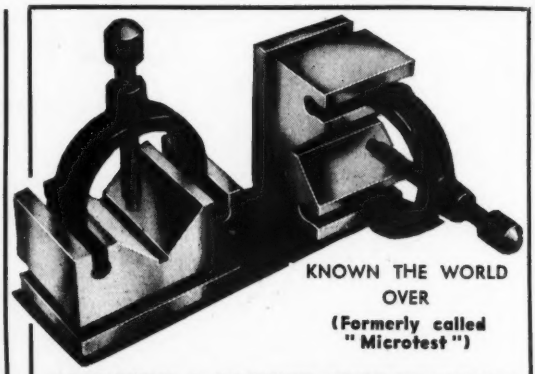
Trade Supplied

SCOT URQUHART LTD. VANDYKE 5708/9

373a EARLSFIELD ROAD : LONDON S.W.18.



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HARDENED & GROUND MIRROR FINISH

CAN BE **USED ON 5 FACES** *DUE TO THE*

FLUSH FITTING CLAMP DESIGN

THE FINEST BRITISH MADE VEE BLOCKS

No. 1 2½" x 1⅜" **£5.10.0** per pair

MICROVEE

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VARI SPEED MODELS SU 1 · SU 2 · SU 3 · SU 4 · SU 5

- Infinitely Variable Feeds to Table
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- Independent Motor for Swing over Internal Grinding Unit
- Built to Schlesinger Limits
- Can also be Equipped for Crankshaft Grinding

AT A PRICE YOU CAN AFFORD !

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INTERNAL GRINDING SPINDLE
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SPLASH GUARDS AND STEADIES

SU1	10 x 24	£1,639
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SU3	10 x 50	Prices on Application
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Also ask for details on

SURE HYDRAULIC SURFACE GRINDER
TABLE 10" x 30" INFINITELY
VARIABLE FEEDS & SPEEDS £2270

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CONVEX & CONCAVE RADII from ·5"

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The 'Habit' Radform is a completely universal radius generator providing for all types of radius dressing on surface and other grinders using wheels up to 7½ in. diameter. It is in fact two instruments in one. A robust conventional dresser which in seconds can be adjusted to give corrected diamond travel to enable small full concave radii to be generated.

'HABIT' RADFORM Regd. **RADIUS GENERATOR**

EXCLUSIVE **'HABIT'** FEATURES INCLUDE

- Anti-friction, wear resisting, correction mechanism.
- "Full-House" sealing against dust.
- Built-in dial gauge setting.
- Positive graduated arc limitation.
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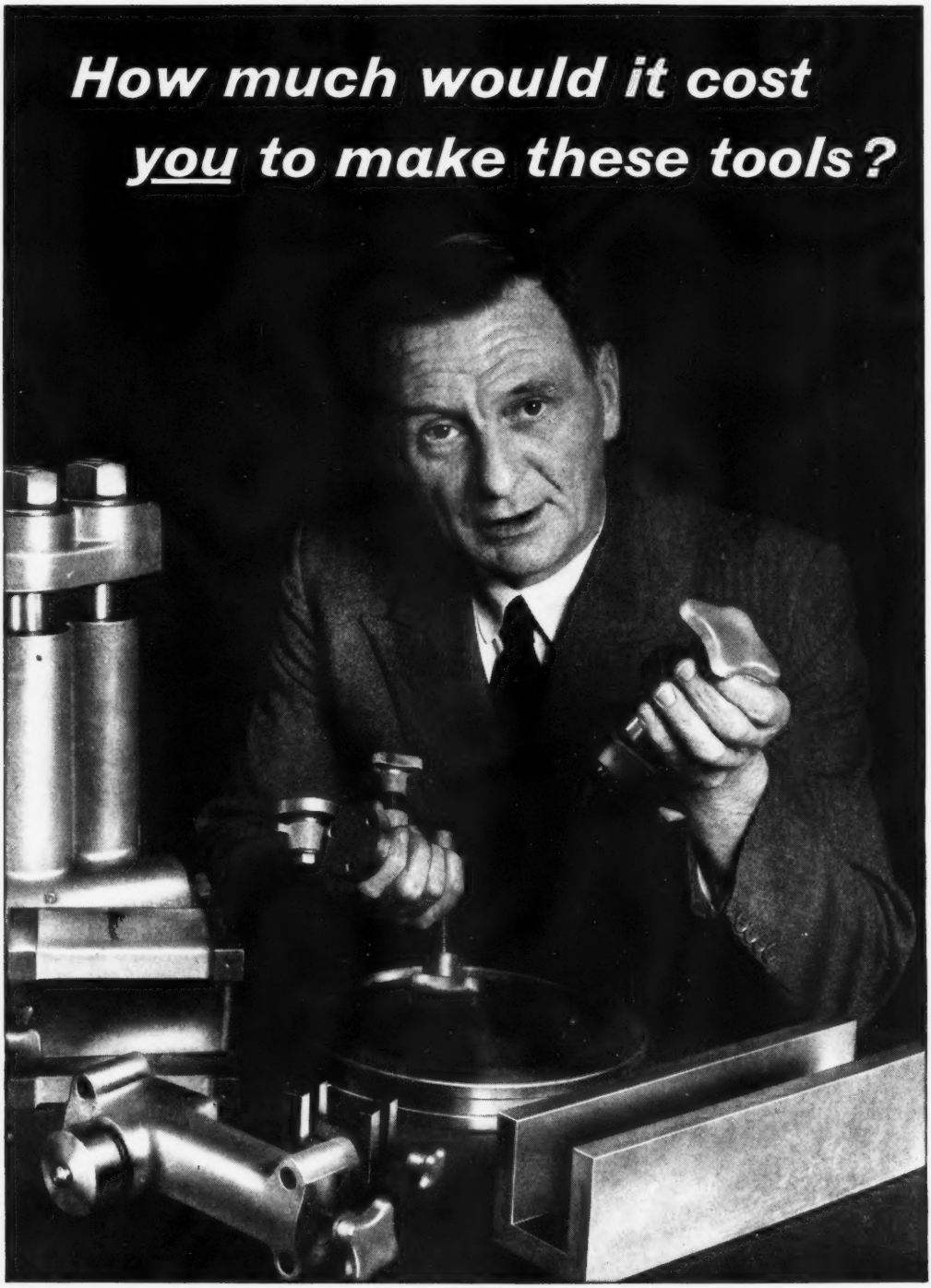
It pays to make it a **'HABIT'**

HABIT DIAMOND TOOLING LTD., LURGAN AVENUE, LONDON, W.6. Telephone: FULHAM 7944

'HABIT'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you to make these tools?

1961

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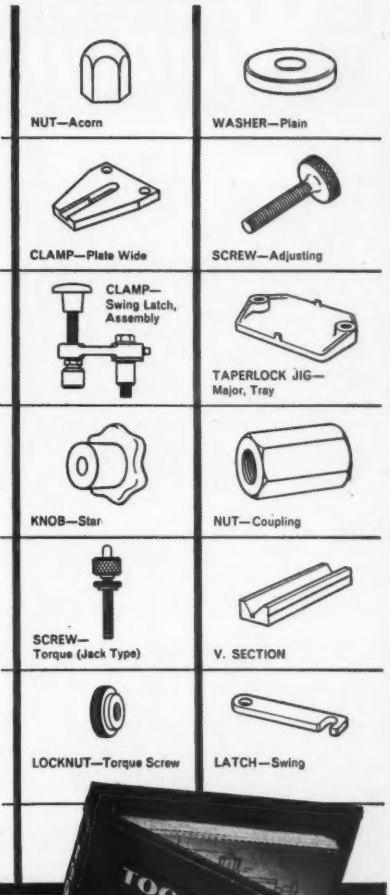

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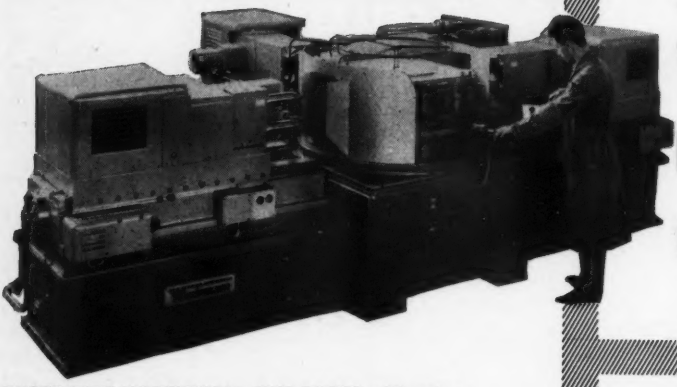
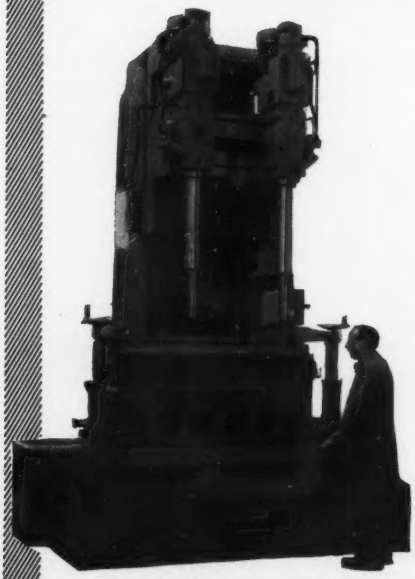


THREE WAY HORIZONTAL FINE BORER with rotary table for rough and fine boring, facing and chamfering connecting rods.

THREE SPINDLE VERTICAL FINE BORER with automatic loading and indexing table. Fine boring piston gudgeon pin holes.



TWO SPINDLE VERTICAL FINE BORER, roughing and finishing diesel engines cylinder bores.

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Over 45,000 Bridgeport TURRET MILLERS in use!

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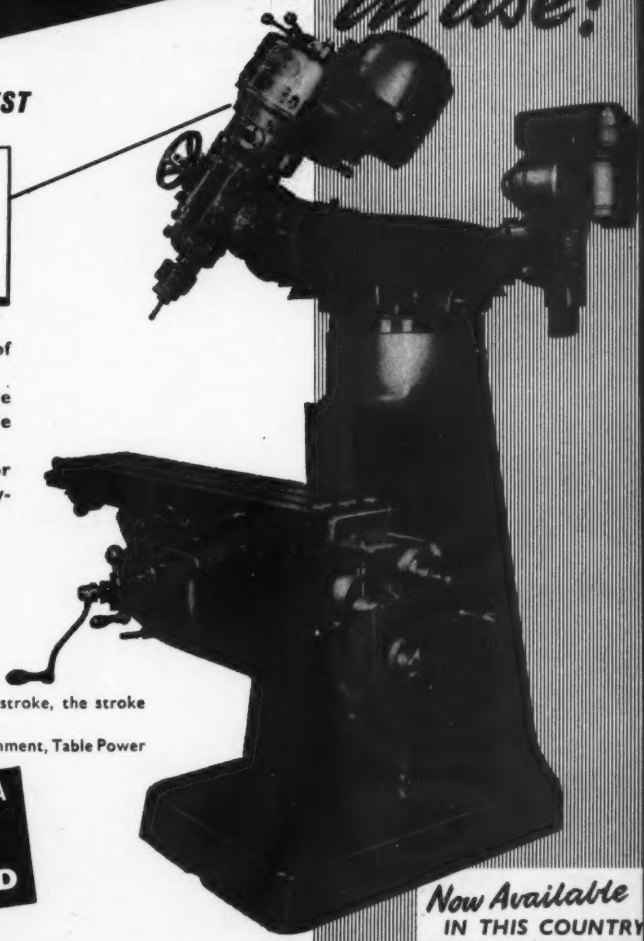
Model "J" 1 h.p. Milling, Drilling and Boring Head. 5" Quill Travel. 3 rates of power down and up feed to quill. Fitted with Ultra-precise (ABEC 7) bearings.



- **Head can be set in 2 planes by means of worm gearing.**
- **Ram can be re-positioned over the table without re-checking squareness of spindle to table top.**
- **Rear end of the ram is designed for mounting of Milling, Shaping or Cherrying Heads.**
- **Table sizes 32", 36", 42", 48" x 9".**
- **Cross travel 9" or 12".**

Other attachments available

Model "T" Cherrying Attachment.
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Model "E" Vertical Shaping Attachment with 4" stroke, the stroke being variable in 1/16 increments by dial selector.
2D and 3D Hydraulic Duplicators, Measuring Attachment, Table Power Feed Unit, etc.

THE NEXT BEST THING TO A BRIDGEPORT MILLER IS A BRIDGEPORT HEAD

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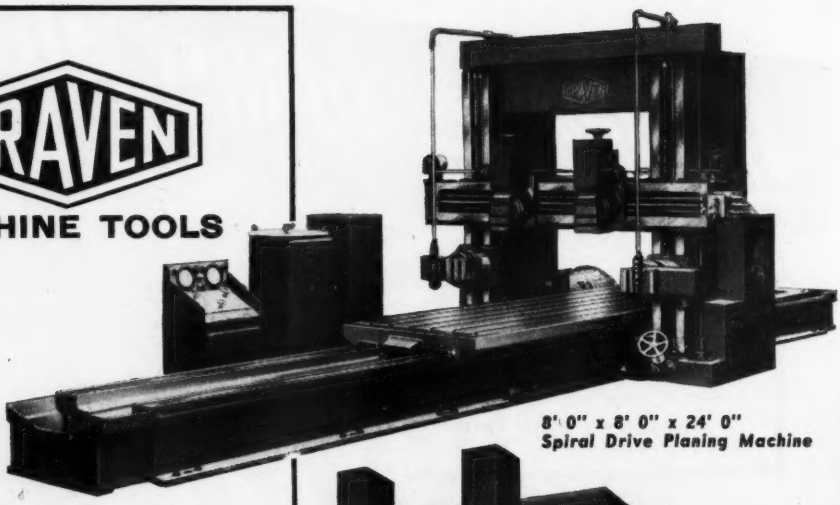
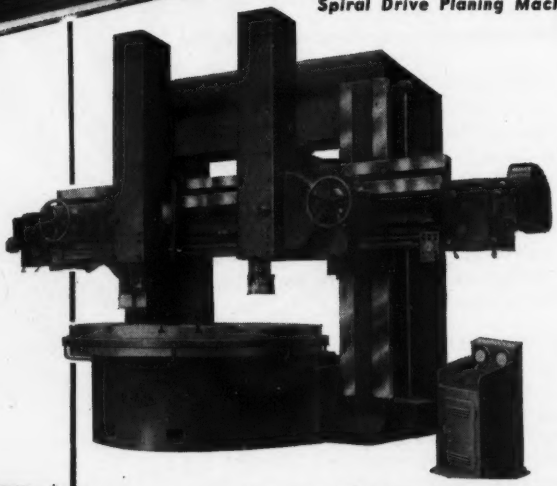
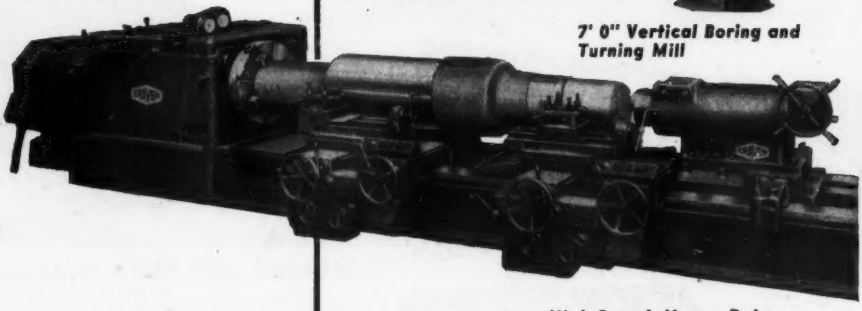


8' 0" x 8' 0" x 24' 0"
Spiral Drive Planing Machine

CENTRE LATHES from 16" height of centres
BORING AND TURNING MILLS from 5' 0" dia. table
PLANING MACHINES from 8' 0" work width
ROLL TURNING LATHES
ROLL GRINDING MACHINES
HORIZONTAL BORING AND MILLING MACHINES
GEAR HOBBING MACHINES 40" to 21' 0" work dia.
HIGH SPEED TUBE BORING AND TREPANNING MACHINES
RAILWAY WHEEL LATHES
RAILWAY AXLE LATHES
CRANKSHAFT LATHES
ROTARY CRANKPIN MACHINES



7' 0" Vertical Boring and Turning Mill



High Speed, Heavy Duty, Sliding and Surfacing Lathe, 20" height of centres, 100 h.p. drive.

CRAVEN BROTHERS (MANCHESTER) LIMITED
VAUXHALL WORKS · REDDISH · STOCKPORT · ENGLAND

CMT 22

Resistance welding generates heat at the workpiece and in other quarters.
Its fabricating miracles create fiery enthusiasm. Its inherent limitations create hot controversies when low power factor, unbalanced loads, complicated and expensive controls and accessories and additional transformers conspire to push up costs and hinder production.
The Sciaky Patent 'Three-Phase' principle beats these problems by drawing a balanced load from all three phases of the supply to produce highly efficient direct current at the welding electrodes.
Sciaky 'Three-Phase' welders operate on only ¼ the current required by an ordinary A.C. welder—think—you can actually put four times the production capacity on your existing plant power distribution facilities.
Invented and patented by Sciaky, the 'Three-Phase' principle of resistance welding offers direct savings . . . lower installation costs, smaller distribution lines, and smaller switchgear . . . and better welding conditions.
Sciaky patent 'Three-Phase' with better than 80% power factor gets ready approval from the power supply authorities, too.
A lifeline to industry, that's Sciaky patent 'Three-Phase'! Write for fully illustrated technical bulletin No. 132.

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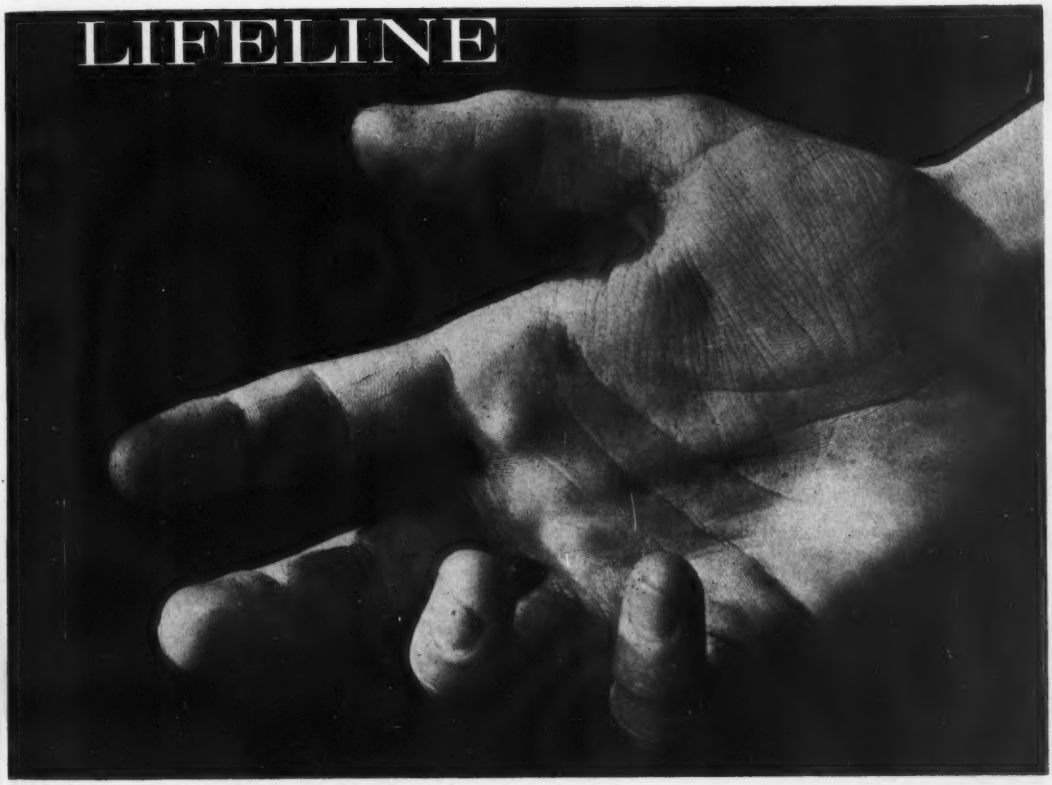

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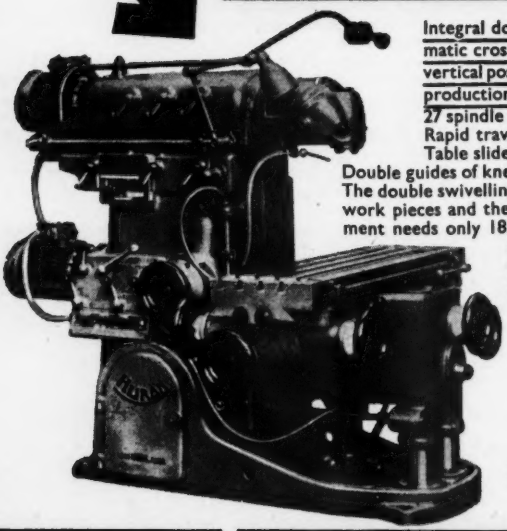


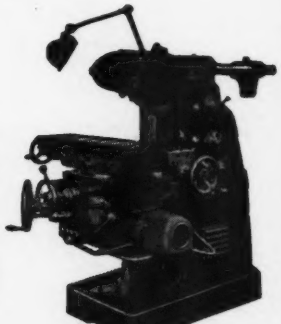
Integral double swivelling universal head provided with 27½in. automatic cross feed by the sliding ram, can be set to the horizontal or vertical position, or to any angle instantaneously—permits the heaviest production cuts. Head can be retracted completely from table line. 27 spindle speeds from 30 to 2,066 r.p.m., 27 feeds from $\frac{1}{16}$in. to 30in. Rapid traverses in all directions. All operating controls duplicated. Table slides directly in the knee without cross movement or swivel. Double guides of knee permit components in excess of 1¼ tons to be machined. The double swivelling universal head requires an opening of only 14in. to enter work pieces and the whole sliding ram with its 27½in. automatic cross movement needs only 18in. clearance. OPTIONAL EXTRA FEATURES: Mounted spacing casting assemblies providing additional 8in. capacity under spindle. 26in. wide 8 T-slot tables and 39⅜in. automatic cross feed of sliding ram with special heavy duty knee and front operating position.

Type	Table	Automatic Feeds Long	Cross	Vert.
KU4	56¾in. × 15¾in.	43¾in.	27½in.	19¾in.
KU5	64¾in. × 15¾in.	51¾in.	27½in.	19¾in.
KU6	78¾in. × 16¼in.	59in.	27½in.	19¾in.
KU55	64¾in. × 26in.	51¾in.	39⅜in.	18¼in.
L83	157in. × 59in.	118in.	39⅜in.	59in.

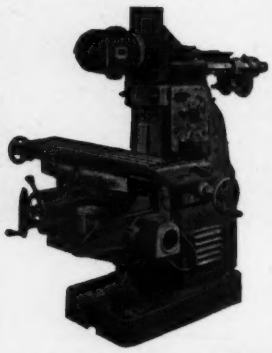
Type 'L' Open-side Traversing Head Universal Miller will mill, bore, slot and drill the largest work-pieces at one setting. The unique design permits greatest variety of operation on large work-pieces; the component remains stationary on the large work-table. Upright slides full length of base table and the sliding ram moves vertically and horizontally.

DUFOUR UNIVERSAL MILLERS

WITH DOUBLE UNIVERSAL SWIVELLING HEAD, RETRACTABLE SLIDE BRACKET AND SPACING CASTING GIVING 26" DAYLIGHT ON No. 59 AND 21" ON No. 61



FOR ALL MODELS Direct reading dial change for speeds and feeds. All parts subject to wear hardened and ground and completely interchangeable. Built to closest tolerances. Rapid traverses in all directions. Table swivels 30°. No. 40 taper for main horizontal spindle, double swivelling universal head, dividing head and rotary table. Hardened and ground centre guide for slideways. Twin overarms. Double swivelling sliding spindle heads with speeds 53-3000 r.p.m Double swivelling universal head on retractable slide bracket providing with 5¼in. Spacing Casting Drive assembly on 59 Machine 26in. daylight, and 21in. on No. 61.



MODELS 53 & 61. 16 universal head spindle speeds 21-1600 r.p.m.; 8 horizontal spindle speeds 21-1180 r.p.m.; 8 automatic feeds ½-18¾in.

MODEL 59. 36 universal head spindle speeds 14-1780 r.p.m.; 12 horizontal spindle speeds 21-1180 r.p.m.; 16 automatic feeds ¾-20in.

MODEL 54. Automatic cross feed of universal head 20in.; 18 universal head spindle speeds 12-1500 r.p.m.; 36 horizontal spindle speeds 6-1500 r.p.m.; 18 automatic feeds $\frac{1}{16}$-23¾in.

Type	Table	Automatic Feeds Long.	Cross	Vert.
53	43½in. × 9¾in.	27½in.	9¾in.	15¾in.
61	47½in. × 10¾in.	30¾in.	9¾in.	15¾in.
59	51⅛in. × 11¾in.	34¾in.	11⅜in.	21⅛in.
54	67in. × 14¾in.	43¾in.	14¾in.	20¾in.

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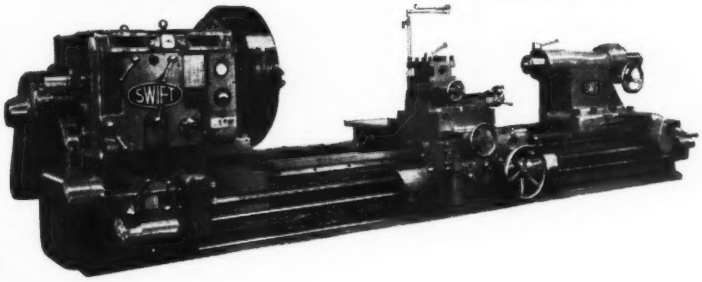
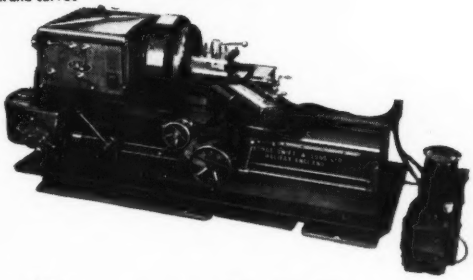


42in. swing Extra Heavy Duty Centre Lathe with 16ft. between centres.



12SV6 Lathe, 28in. swing, with 2ft. 6in. between chuck and turret

CENTRE LATHES are available with swing over bed 18½in. up to 72in. and any length of bed.

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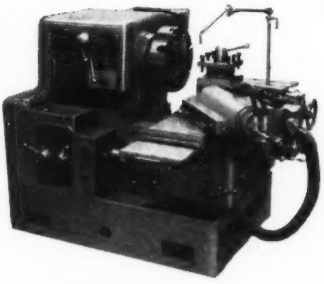

Right Angle Chucking Lathe for face copying by hydraulic control. Maximum diameter admitted on this type 48in.

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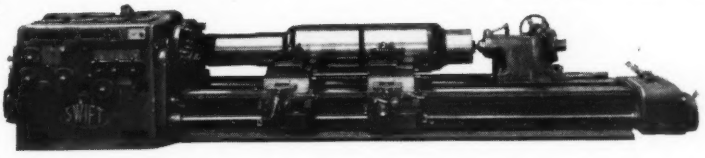

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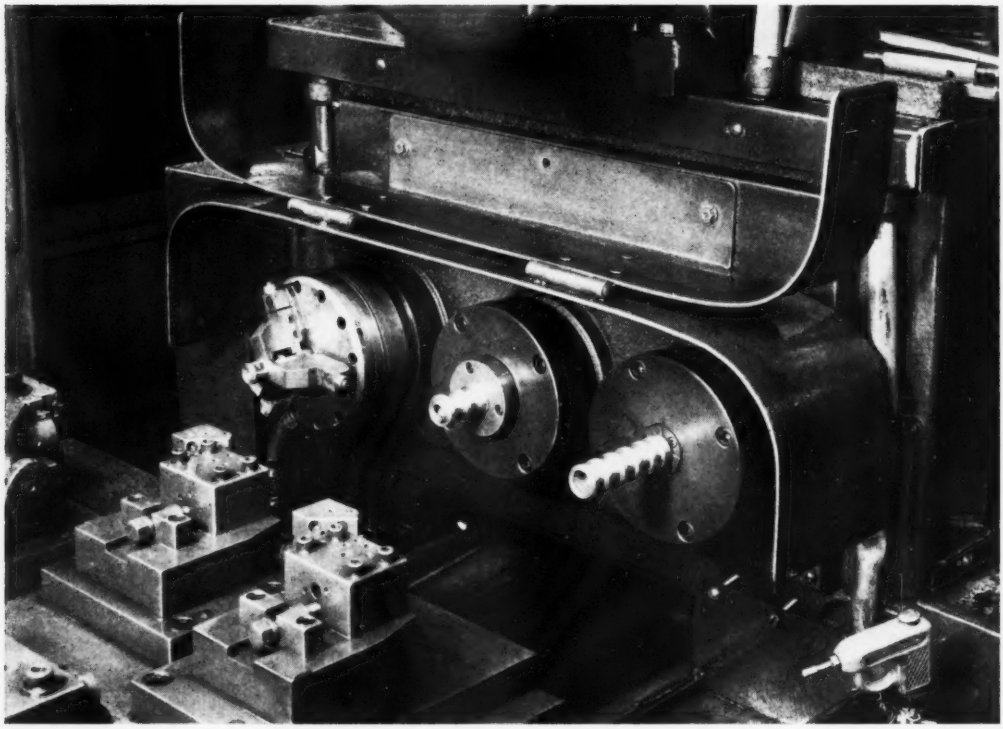

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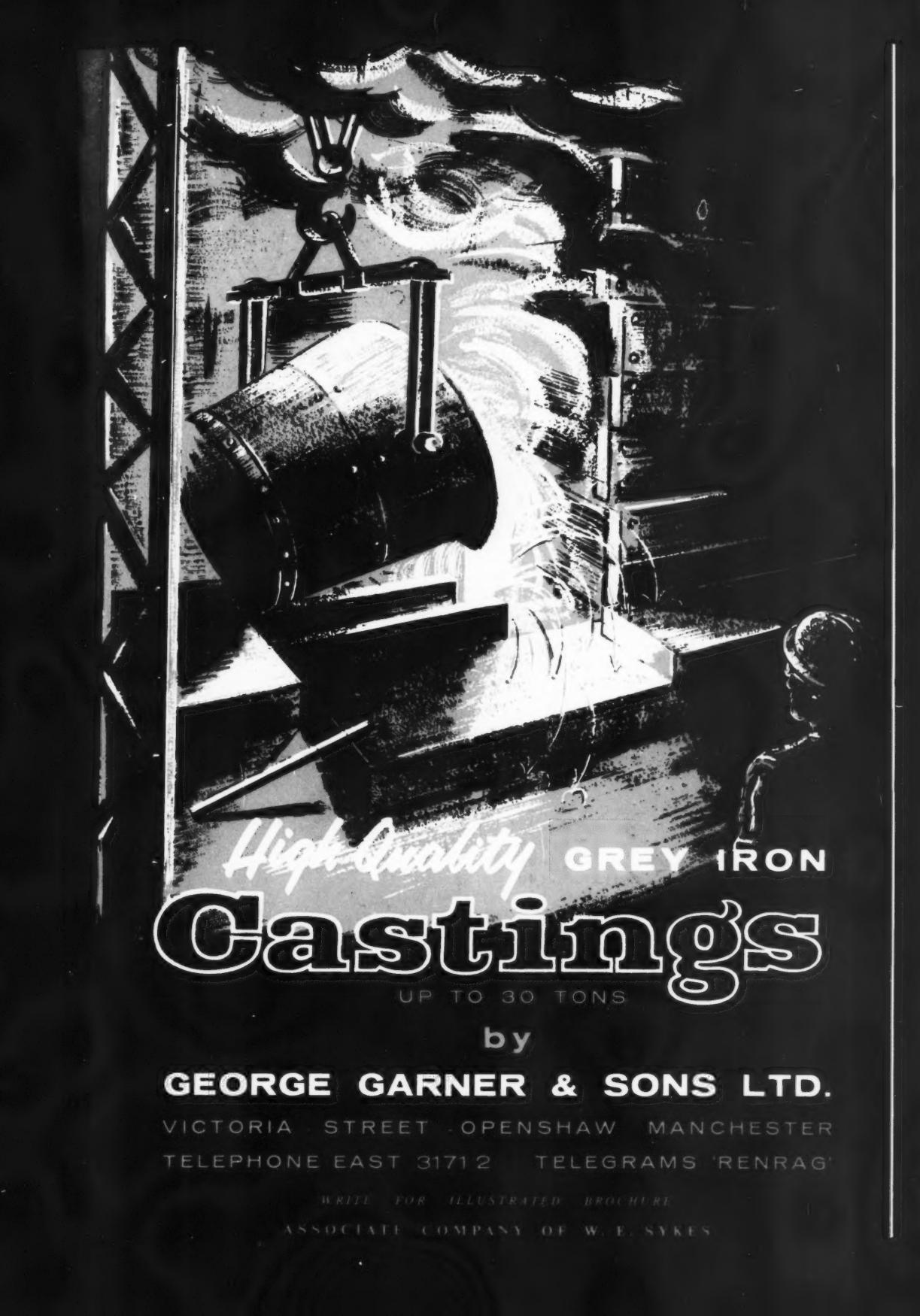
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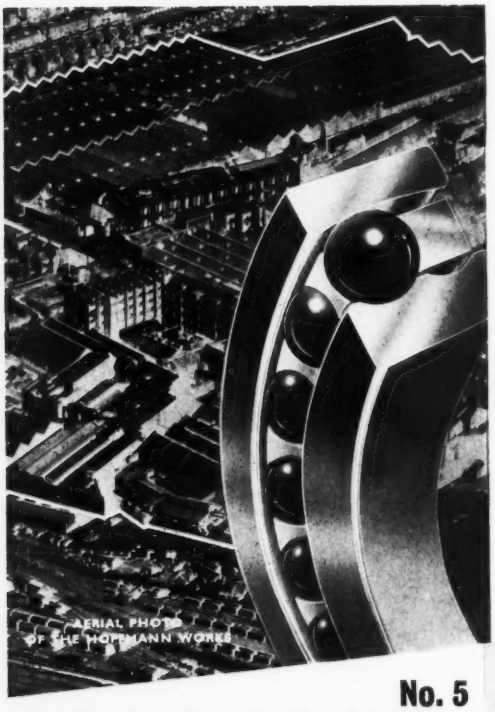

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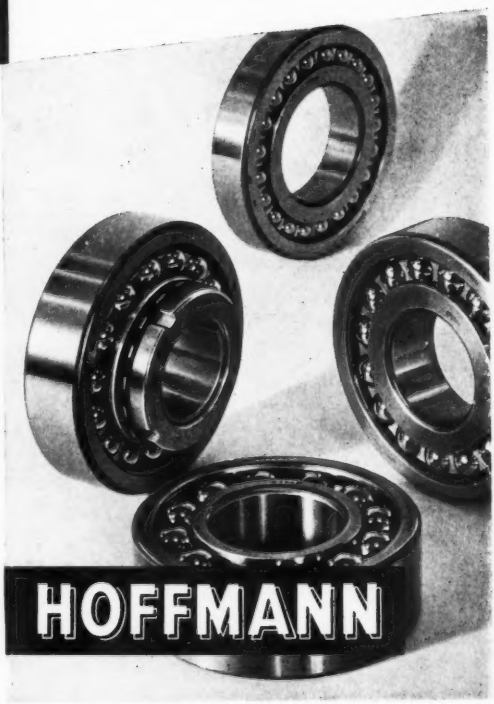

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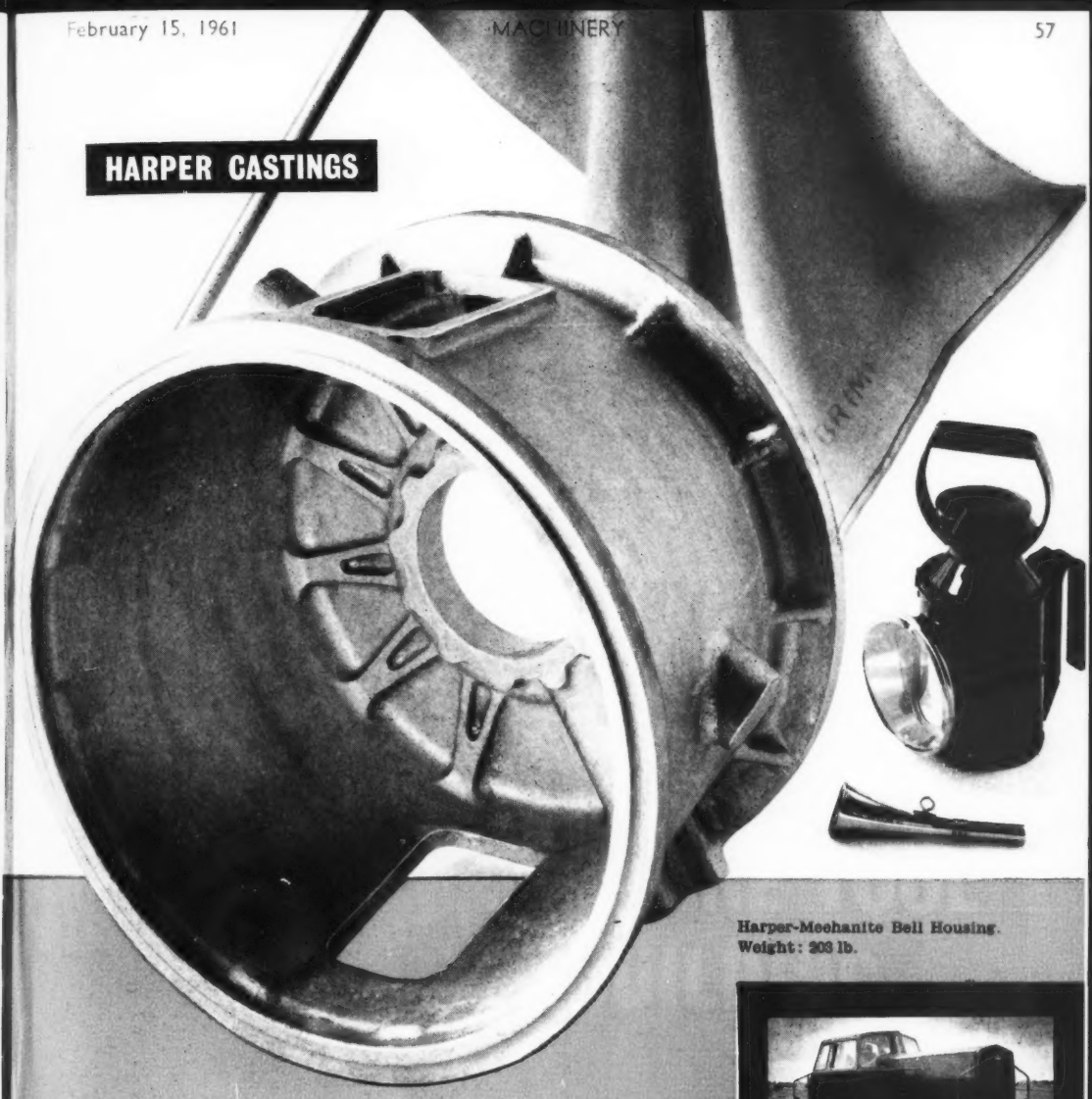

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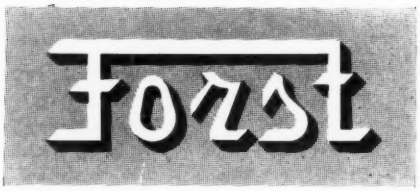

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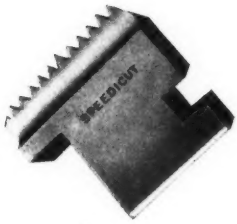
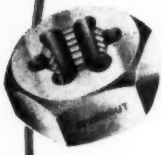
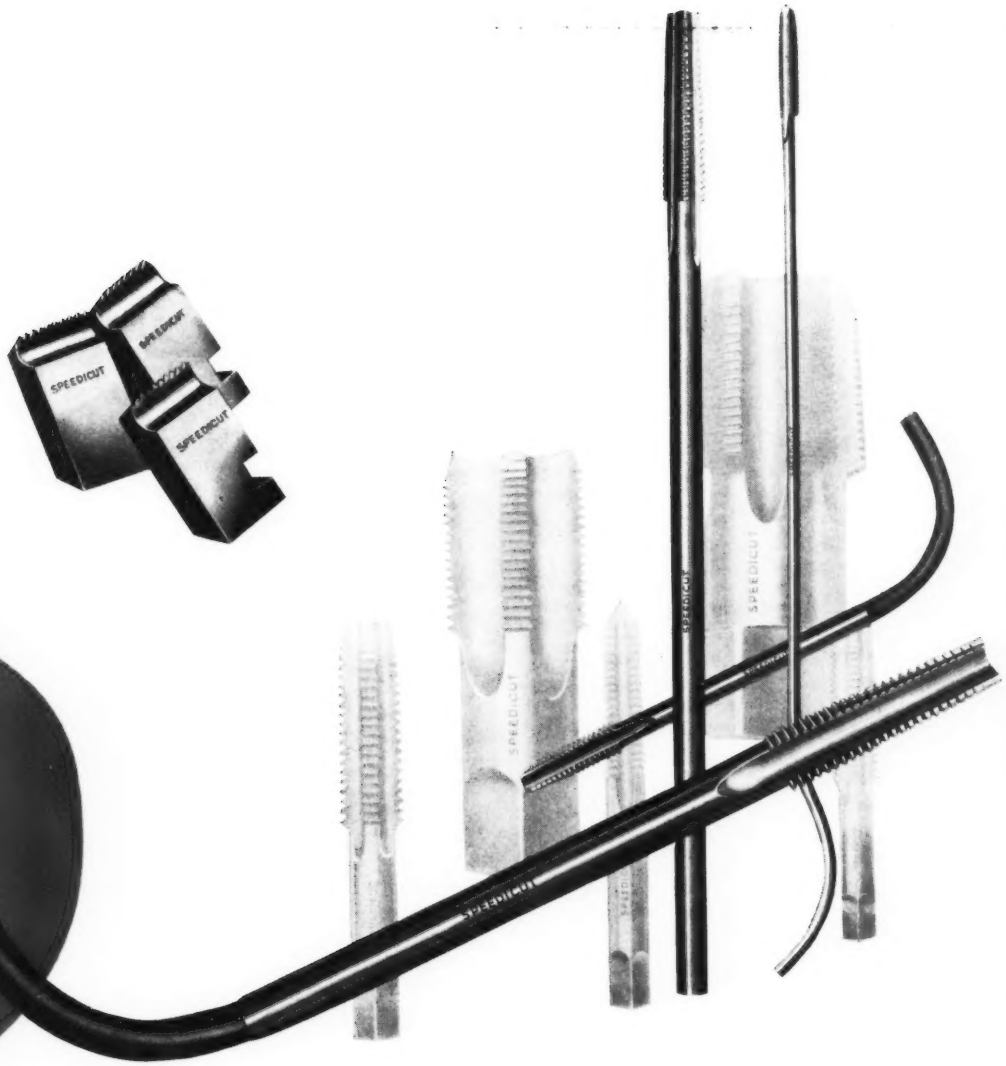


TAPS AND SCREW THREAD TOOLS



FIRTH BROWN TOOLS LIMITED



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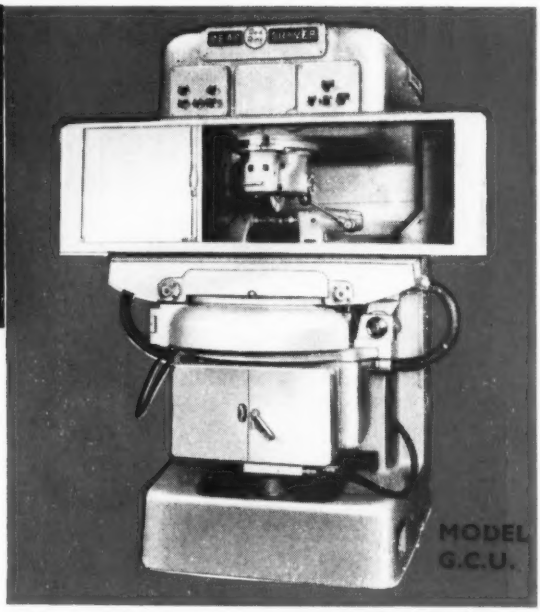
Red Ring

UNIVERSAL DIAGONAL GEAR SHAVING



All of the significant improvements and refinements in gear shaving practice for the past 30 years are incorporated in the Red Ring Universal Diagonal Gear Shaving Machine, Model GCU, to make it the most versatile and effective unit of its kind ever built.

In accordance with Red Ring practice, the cutter head which is a relatively small unit is located above the work. Head and tailstocks together with the tables comprise a much heavier unit located below the work and always under compression whether at rest or under load. After being set, the cutter head is clamped while the tables have running clearance.

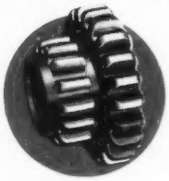
This arrangement also provides two additional advantages. If the work gear is accidentally dropped when being loaded, it cannot damage the cutter. With the cutter above the work chips readily fall away from it.

Gears may be shaved by either the conventional or diagonal method on the Red Ring Model G.C.U.

Gear teeth may be shaved straight, crowned, tapered or to conical form. When crowned, the position and amount of crown may be located along the tooth as required.

Wide or narrow face gears, open or close shoulder gears, plunge hobbed gears or gears with long shafts can be shaved on the Red Ring Model G.C.U.

Loading and unloading may be manual, semi-automatic or fully automatic.



The smaller unit only of this steel cluster gear was shaved in 15 seconds, removing .006in. of stock over pins-crossed axes angle 3°. Unit is 2⅝in. in diameter. It has ⅜in. face, 14 teeth, a 6/8 D.P. and is a close shoulder job.

The large gear on the right of this transmission cluster was crown-shaved in 16 seconds, removing .010in. of stock over pins. It is a 4in. diameter steel gear having a ⅜in. face, 29 teeth and 9.25 D.P.

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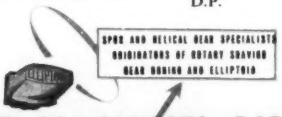
This steel automatic transmission planetary pinion was shaved in 27 seconds, removing .007in. of stock overpins. It has 21 teeth 1.500in. P.D., 14.75 D.P., and a face width of 2⅛ in.



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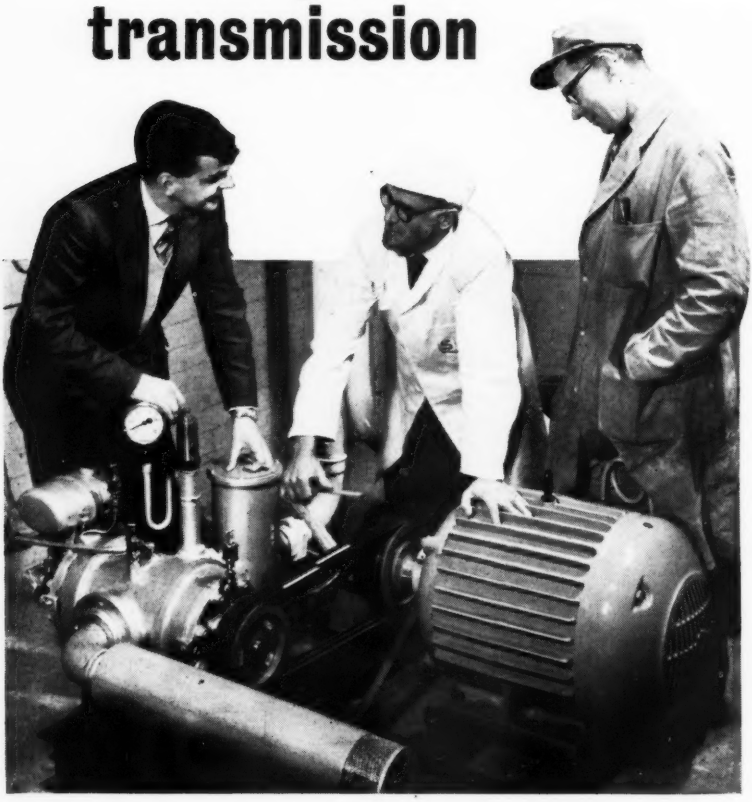

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Available 2 ft. and 3 ft. between centres.
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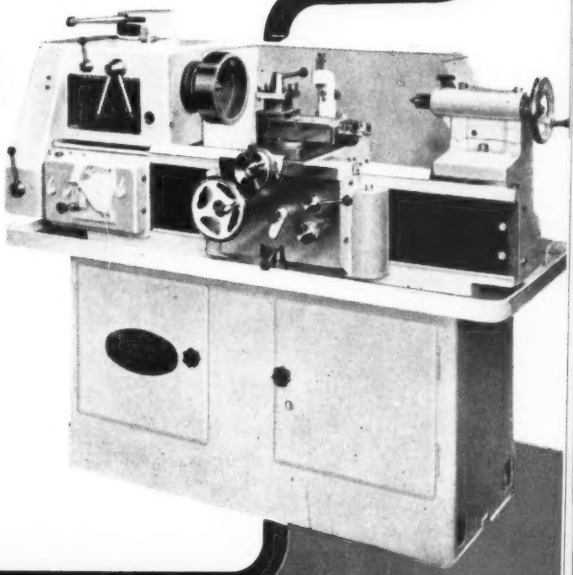

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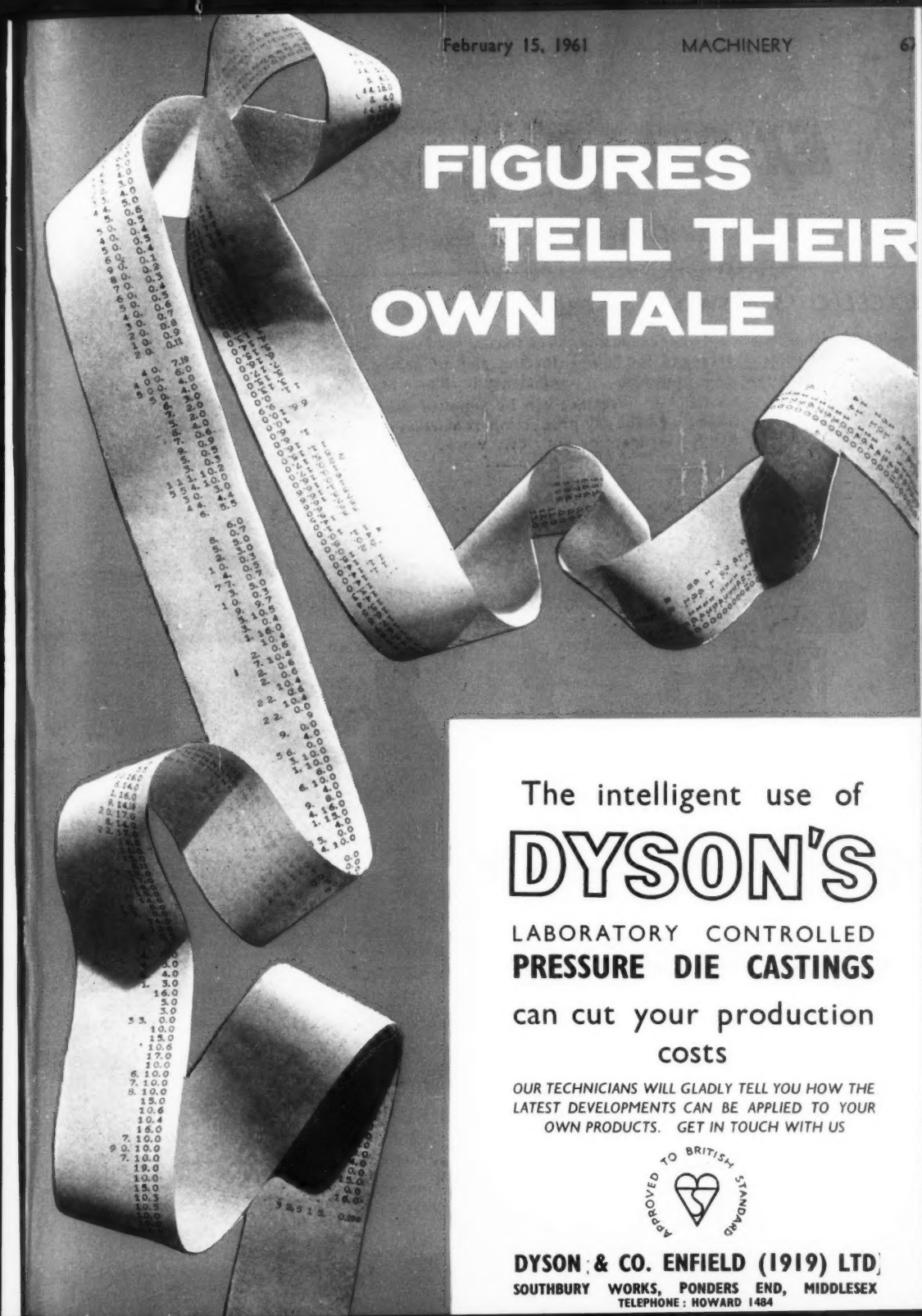

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EXCELLO '54' TWO WAY PRECISION BORING MACHINE

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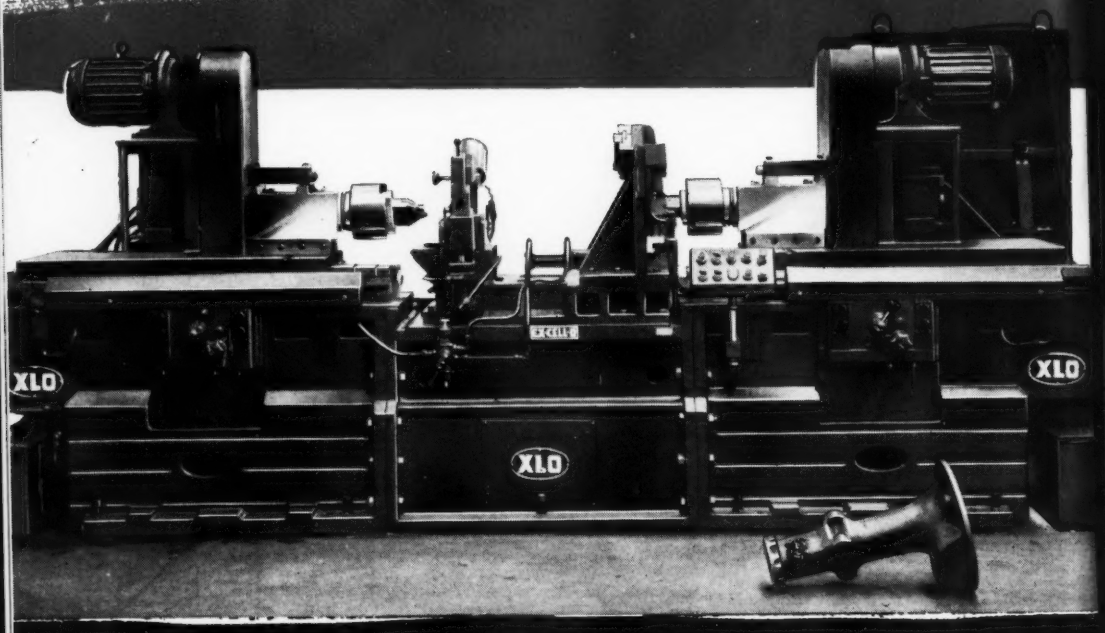
The fixture has hydraulic clamping with manual loading and unloading. Production at 80% efficiency is 28 axle housings per hour.

EX-CELL-O machines can be supplied ready tooled to meet any production requirements. Ask for estimate on your own work.



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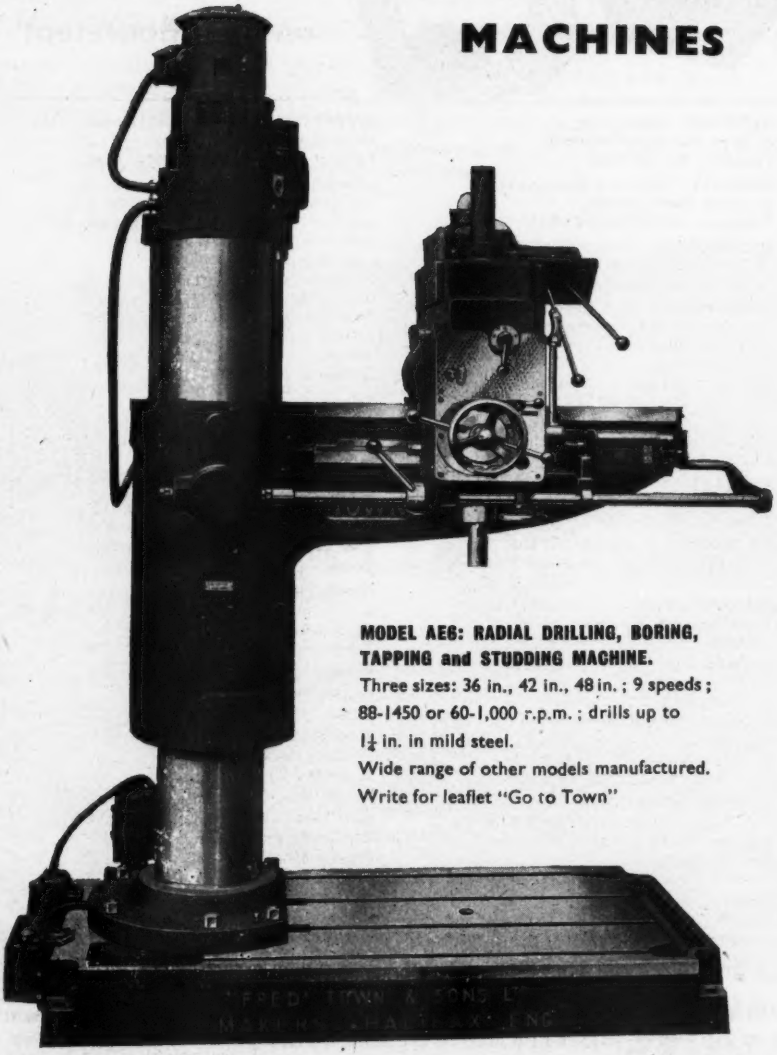

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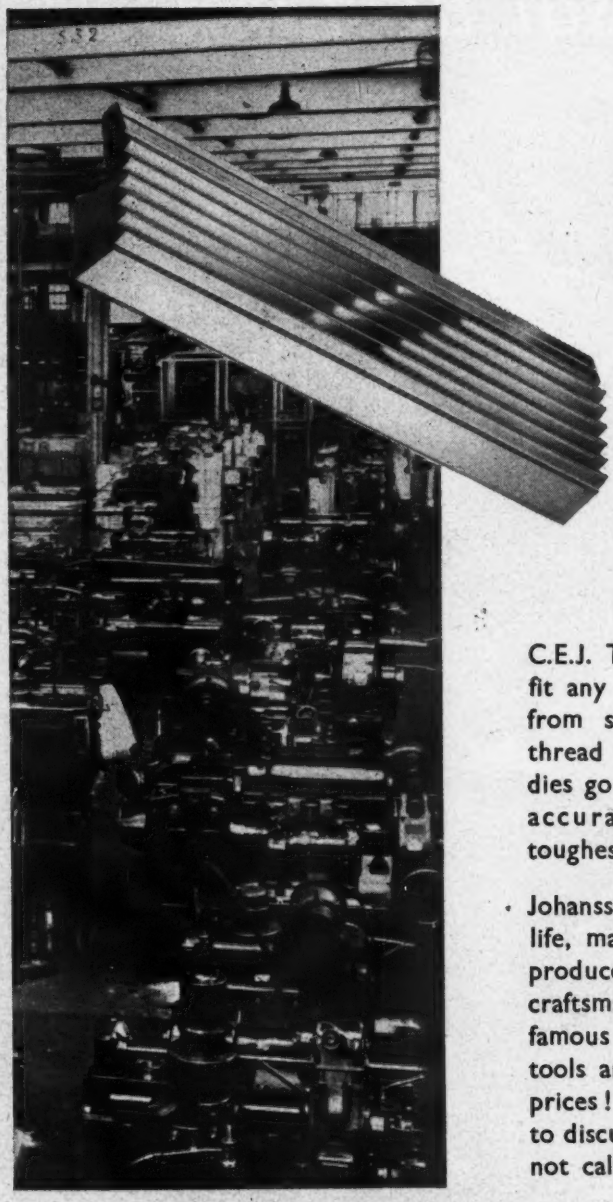

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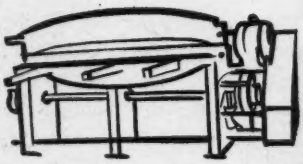

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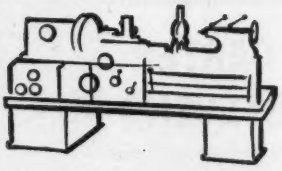

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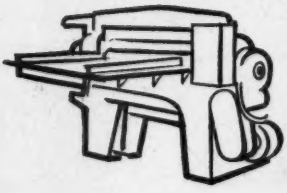
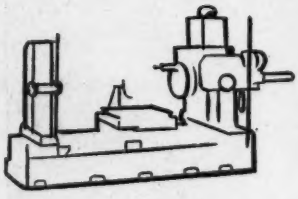


600



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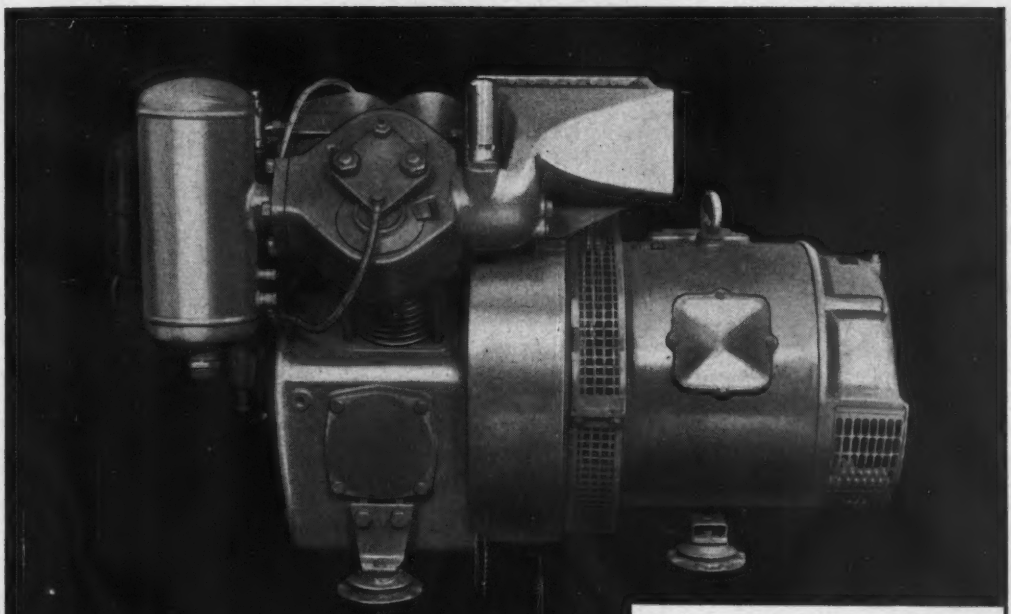

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The compressor is a single-acting, two-stage machine with air-cooled cylinders and intercooler. It is built for a normal working pressure of 100 p.s.i. and has a free air delivery of 141 c.f.m.

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AUTOMATIC CONTROL AVAILABLE TOO!

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WRITE FOR THE LEAFLET

Atlas Copco leaflet E 1207-1 gives full details of the TT6. It is freely available on request from the address below.

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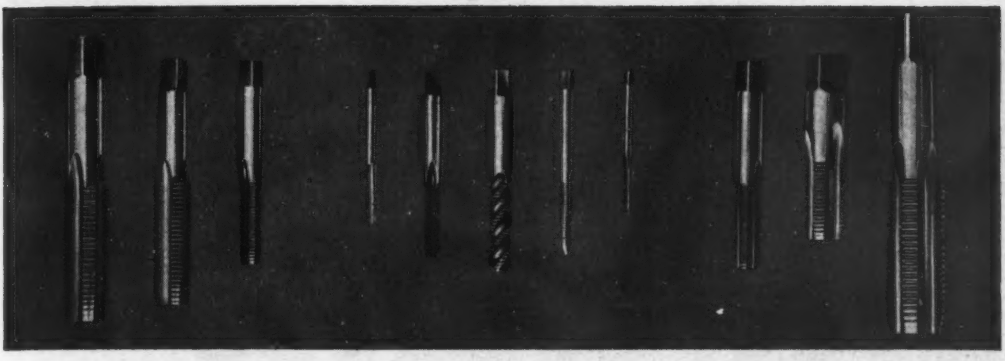

All these tap sizes on one machine

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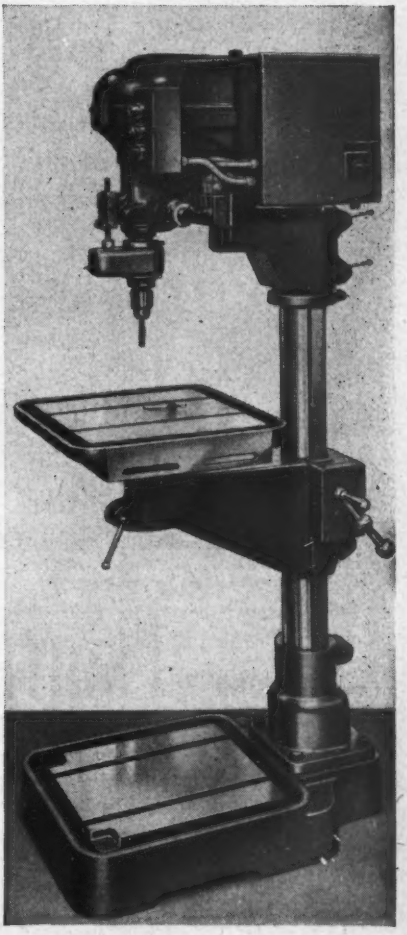

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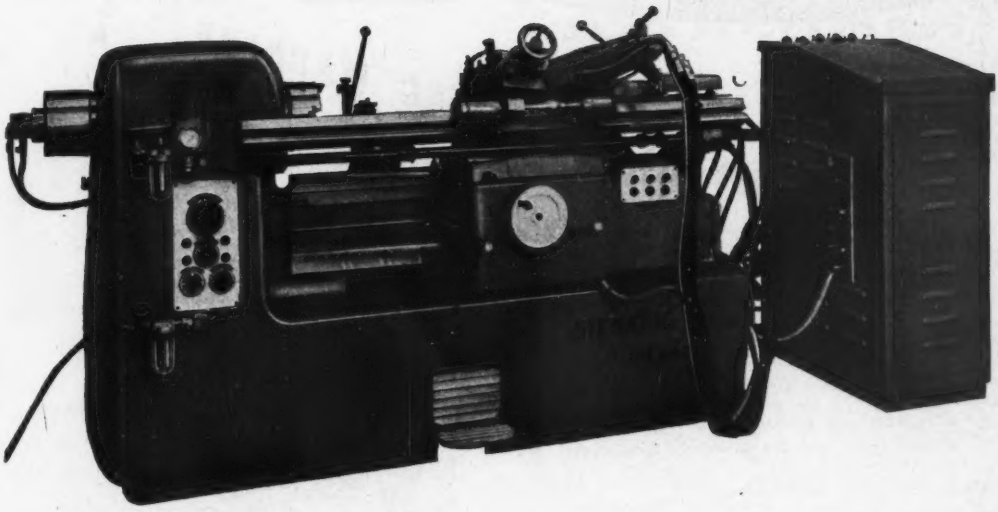

Automatic and Semi-Automatic Hydraulic Profiling Lathes

Specification

Bore of spindle	2½in
Spindle nose	5in. A.S.A.
Max. swing over bed	15½in.
Max. swing over saddle	9½in.
Max. length turned	27½in.
Hydraulic traverse of copying slide	4in.
Hydraulic feed of tailstock spindle	4½in.
Number of feed rates to copying slide	48
Max. tool pressure	1,300 lbs.
Approx. nett weight	5,000 lbs.

7 POINT FEATURES INCLUDE

1 Capacity.
2 Duplomatic Hydraulic System.
3 Hardened Bed Slideways.
4 Auto cycling up to six depths of cut.
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6 Uses template or existing component.
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Basic price under £2,000.

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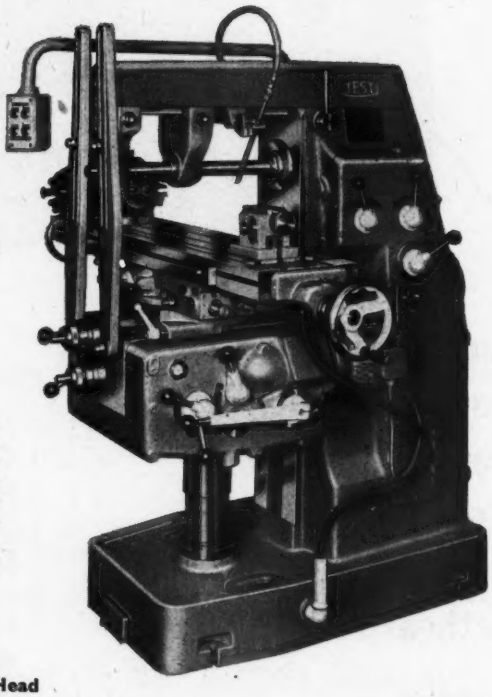

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- ★ **Electro Magnetic Clutch**
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Table:	Working surface ..	48in. by 11in.
Table Feeds:	Longitudinal	.. 29in.
	cross (without brace)	.. 9in.
	vertical	.. 17¾in.
Spindle:	Spindle Nose ..	No. 40 N.S.
	18 speeds	40 to 2000 R.P.M.

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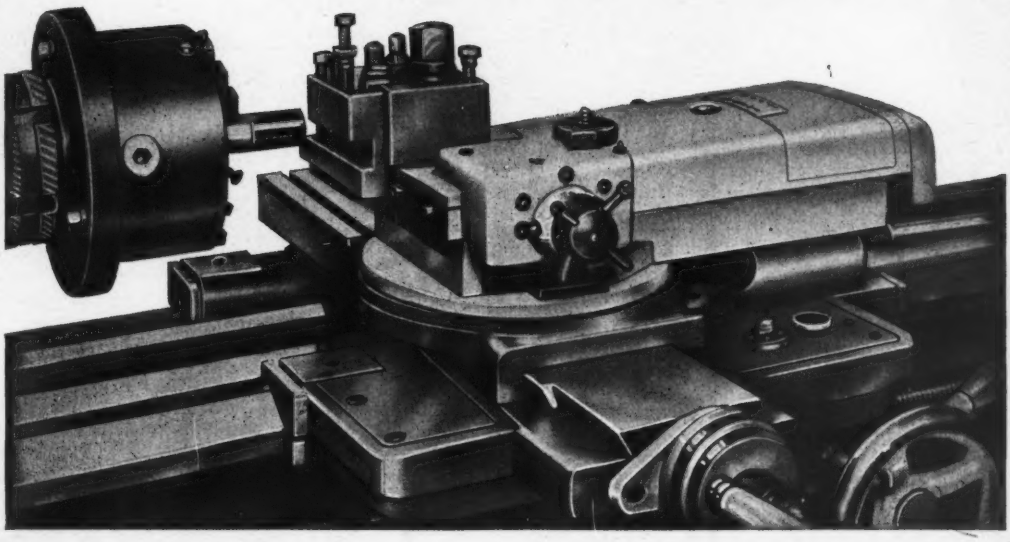

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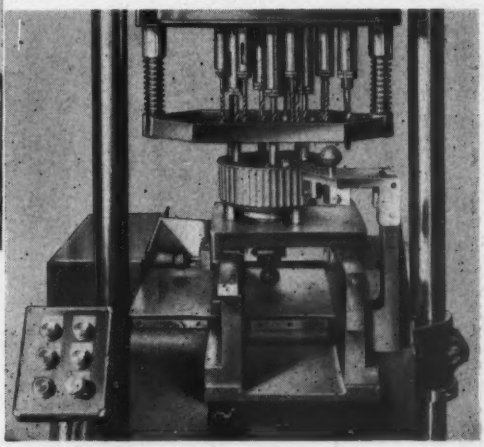
A complete range of fixed centre and adjustable type multi-spindle Heads for attachment to existing machines, together with a comprehensive tooling service are also available.



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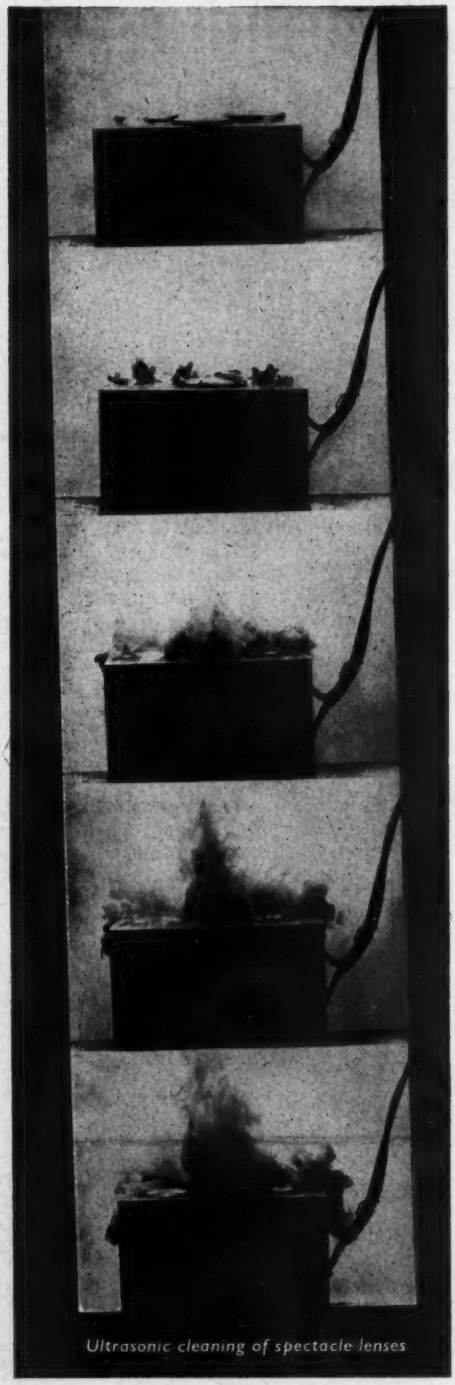

Ultrasonic cleaning of spectacle lenses

Ultrasonic Cleaning

cleans ultra-efficiently

HOW?

By introducing high frequency pressure waves in liquid cleaning media (alkaline or solvents), causing momentary tiny vacua, called cavitations. The effect is a mechanical scrubbing action on surfaces to be cleaned, removing all oily or solid contaminations like dirt, swarf or grease. The pressure waves are created by immersed nickel transducers, which oscillate at a frequency of 22 kilocycles, the source of which is a valve generator converting the mains current to high frequency current.

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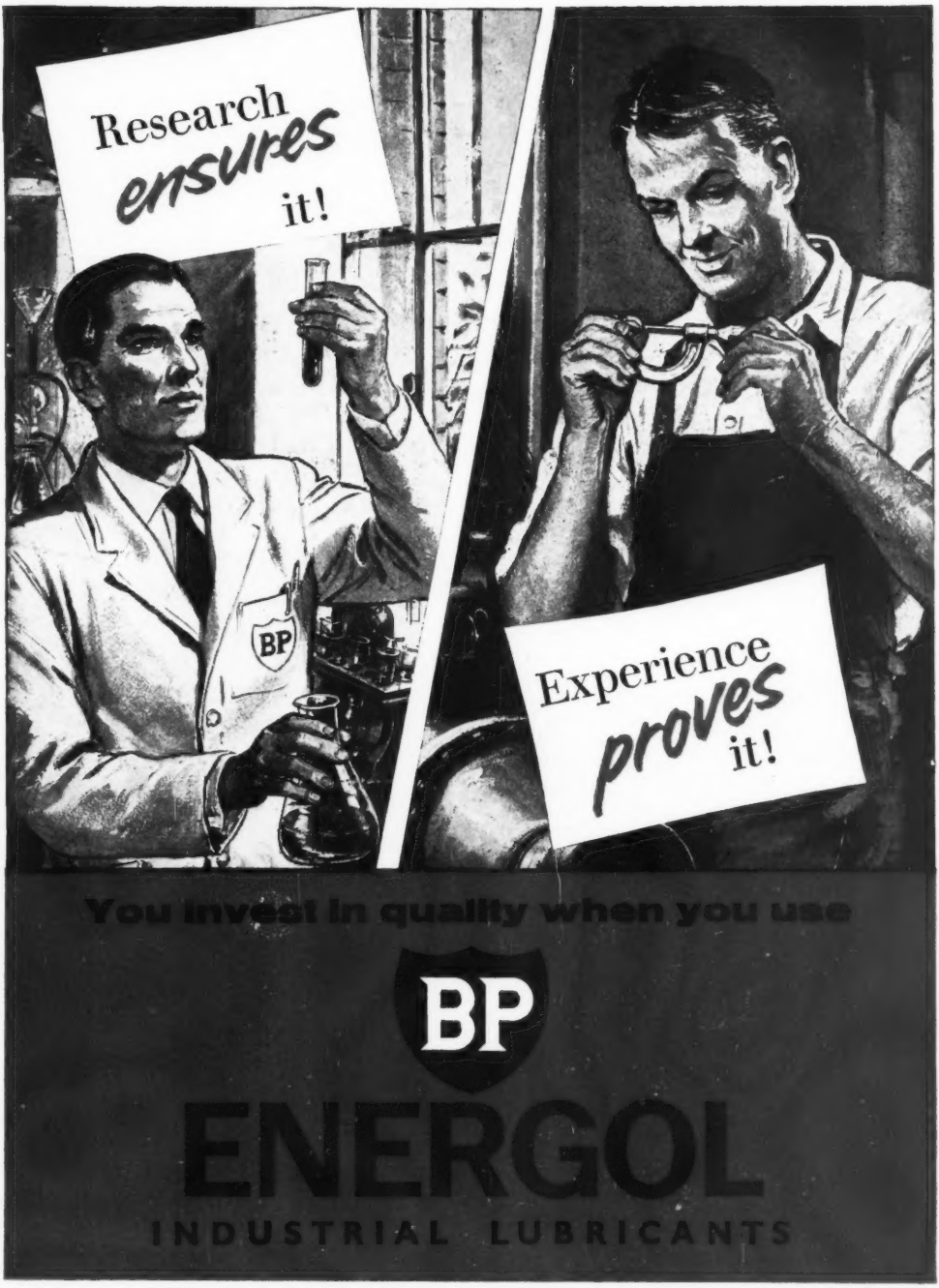

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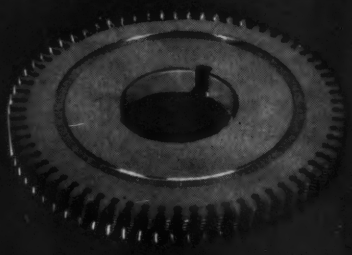

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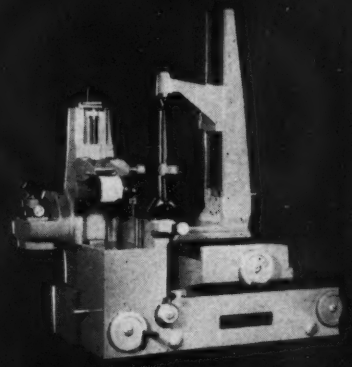

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Test it in any way you like—Spectra-Color defies comparison! You get accuracy and certainty with Spectra-Color; needle sharp lines, permanently bright, there until machined off or removed with Spectra-Remover. It will not smudge, chip, crack, or peel and is unaffected by oil, petrol or water.
Standard Grade for all bright metals and Opaque for black metals and unmachined castings.
In Pints, Quarts, Half Gallons and Gallons.

The only layout and identification fluid in 2 Grades—with each in 13 colours

SPECTRA AIDS TO INDUSTRY

Also Spectra-Spray TOOL ROOM BLUE in handy Aerosol Pack

SPECTRA CHEMICALS LTD

Spectra-Blue
Spectra-Red
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Caterham 3182 & 2293

COLD PUNCHING
13/16" SQUARE HOLES
IN
7/8" THICK MILD STEEL
USING
K E
TOOL STEELS FOR PUNCH AND DIE
Photograph by courtesy of the Pressed Steel Co., Ltd.
Whether the properties you require are toughness, wear resistance, minimum distortion in hardening, red hardness, hardenability, corrosion resistance etc — THERE IS A KE STEEL FOR PRACTICALLY EVERY TOOLING APPLICATION.
KAYSER ELLISON & CO. LTD
CARLISLE STEEL WORKS · SHEFFIELD 4
Telephone: Sheffield 22124 Established 1825
K E High-Grade Tool Steels for COLD Work
This booklet gives full details and is available free on request.
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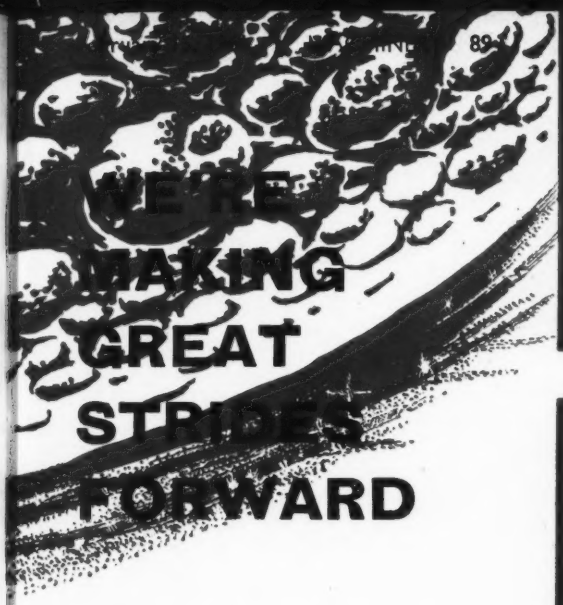
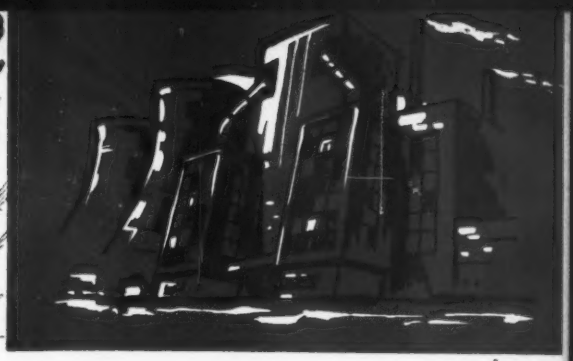
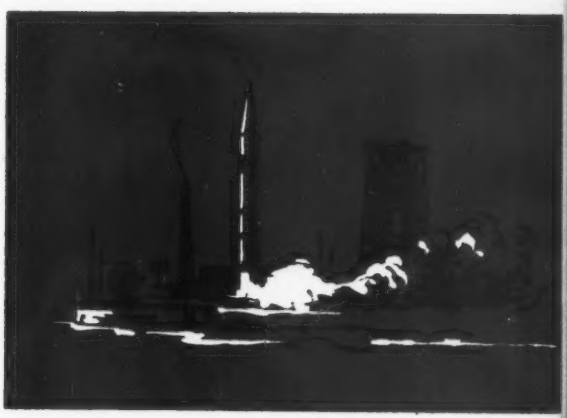
Tel: BAYswater 9131/2.
MIDLAND STOCK WAREHOUSE:
Station Road, Coleshill, Birmingham.
Tel: Coleshill 2041/2.

1961







New projects of science and industry, improved methods of production and new materials to be worked, have brought a challenge—a challenge to provide cutting tools equal to these new demands.

A challenge met by DORMER.

Our experience, technical knowledge and constant research enable us to keep up with modern developments, and our methods of manufacture are co-ordinated to maintain our position in the forefront.

DORMER TOOLS consistently answer present-day needs, and anticipate those of the future.

DORMER

S T
D C
TRADE MARK

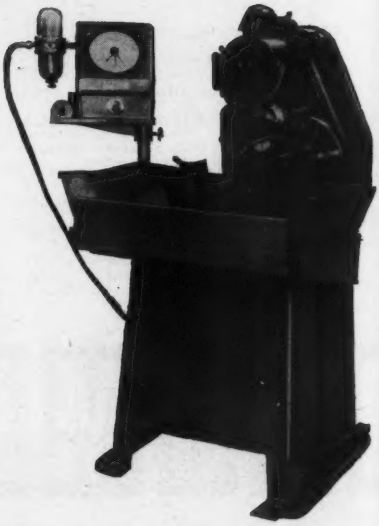
THE SHEFFIELD TWIST DRILL AND STEEL COMPANY LIMITED
DORMER TOOLS ARE OBTAINABLE FROM GOOD CLASS IRONMONGERS

Original SUNNEN HONING MACHINES TOOLS & HONING STONES

—Now available in this country—

Job lots or production runs . . . Sunnen Honing corrects ll hole errors with rapid stock removal . . . eliminates out-f-round, chatter, waviness, bow, taper, barrel shape or ellmouth. Guarantees bore accuracy to well within 0·0001in. ith controlled surface finish as fine as desired.

For stock removal to finish sizing—for deburring and icrofitting, Sunnen Honing is the most economical solution r internal work.



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THOMAS MERCER LIMITED

of St. Albans, Hertfordshire. TELEPHONE REDBOURN 555

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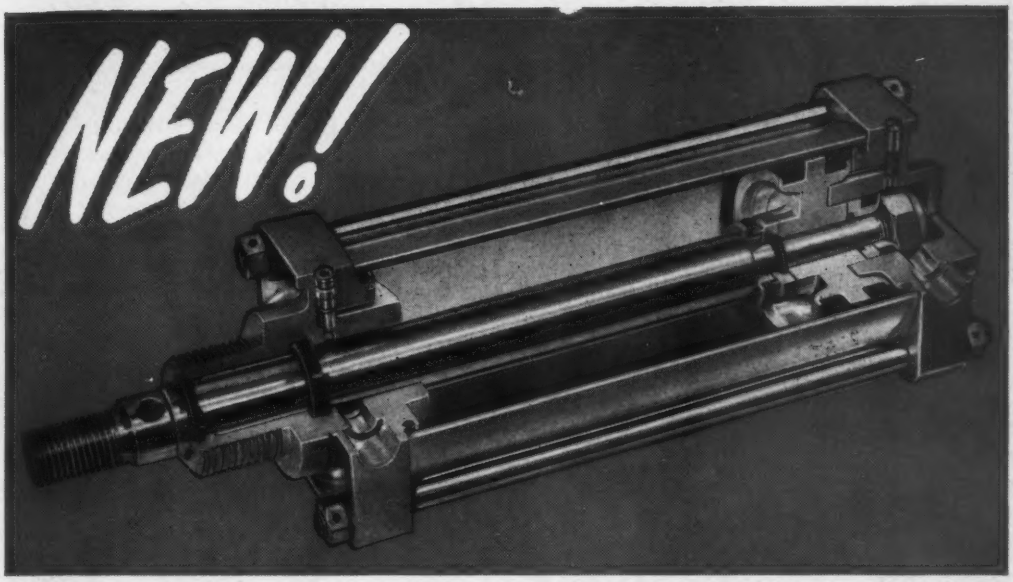
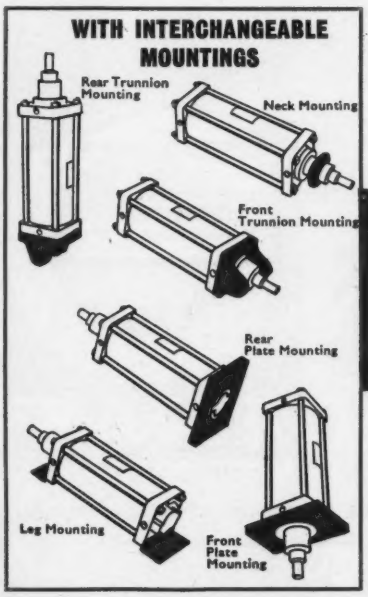
Scottish Agent: J. F. TENNENT, LTD., 52, St. Enoch Square, GLASGOW C.1



Schrader SQUARE-END AIR CYLINDERS

Cushioned or non-cushioned

These new Schrader square-end double-acting cylinders will meet a wide range of applications for holding, positioning or moving work or, with push, pull or lifting movements obviate many tiring manual operations. The cylinders have a standard neck-mounting but the square-end design provides for a variety of interchangeable mountings including leg, front or rear plate, front or rear trunnion. Four bore sizes are available with standard piston strokes, cushioned or non-cushioned. The robust construction and new design features give safe, controlled, low-cost power for air pressures of 5 to 150 p.s.i. This range of Schrader Cylinders offers something really new in construction, performance and adaptability. Send the coupon today for full descriptive details and specifications.



Schrader

SQUARE-END AIR CYLINDERS

Send for full details TODAY

To: **A. SCHRADER'S SON**, Air Control Products Dept. M
829 TYBURN ROAD, ERDINGTON, BIRMINGHAM, 24
Please send details of Schrader Square-End Air Cylinders

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ADDRESS _____

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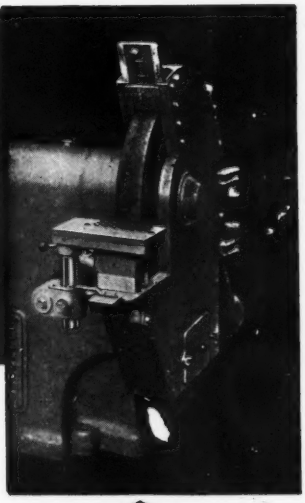
FOR IRON FOUNDRIES
Wheel hoods as developed by the British Cast Iron Research Association can be fitted.

ALL COMPLYING WITH THE 1953 IRON & STEEL FOUNDRIES REGULATIONS



This 16 inch high speed swing frame grinder completely eliminates the dust problem. The dust is taken up at the point of suspension to ensure machine control and balance. It has been filmed in operation by the Factory Inspectorate and complies with all revelant regulations.

FOR STEEL FOUNDRIES
Wheel hoods as developed by the British Steel Castings Research Association can be fitted

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VIADUCT WORKS, BROADHEATH, ALTRINCHAM, CHESHIRE.

'Phone Altrincham 3281 *'Grams: Emery, Altrincham*

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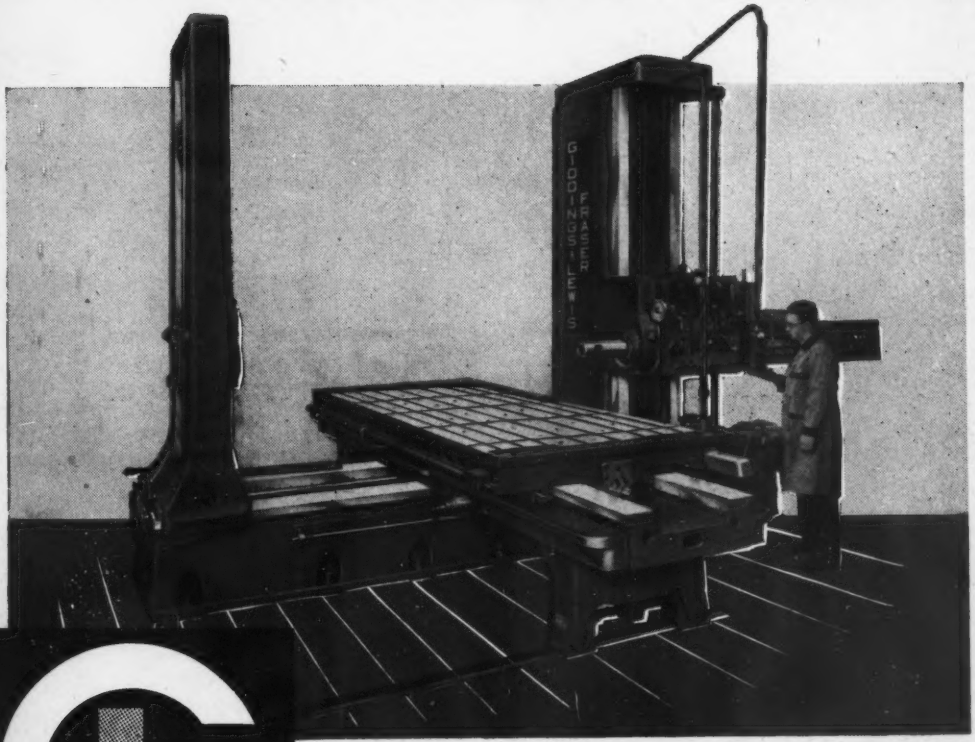
Plus HIGH POWER MILLING



FRASER

gives immediate and competitive advantages

★ **AMPLE POWER** (or really heavy duty milling.

★ **GREATER CAPACITY**—oversize tables fully supported at extreme positions.

★ **GREATER ACCURACY**—improved measuring device giving readings to 0·0001 in.

★ **INDEPENDENT OPERATION** of saddle, table and headstock.

★ **SPEEDS AND FEEDS** cover every requirement from heavy milling to fine boring.

GIDDINGS & LEWIS—FRASER

HORIZONTAL MILLING, BORING AND DRILLING MACHINES

Model 340-T: 4in. Spindle. Model 350-T: 5in. Spindle. Table Working Surfaces: 36in. by 72in. to 60in. by 144in. Max. Table Cross Traverse: 132in. Beds: 72in. to 168in. long.

Full range of extras available, including extended saddle with floor runways, automatic electric positioning, continuous facing and boring heads rotary table, etc.

ASK FOR FURTHER DETAILS AND COMPLETE CATALOGUE.

Made by GIDDINGS & LEWIS-FRASER LTD., ARBROATH, SCOTLAND. Telephone: Arbroath 2033. Telegrams: Galfra Arbroath.
Sole U.K. Agents: ROCKWELL MACHINE TOOL CO. LTD., Welsh Harp, Edgware Road, London, N.W.2. Telephone: Gladstone 0033.

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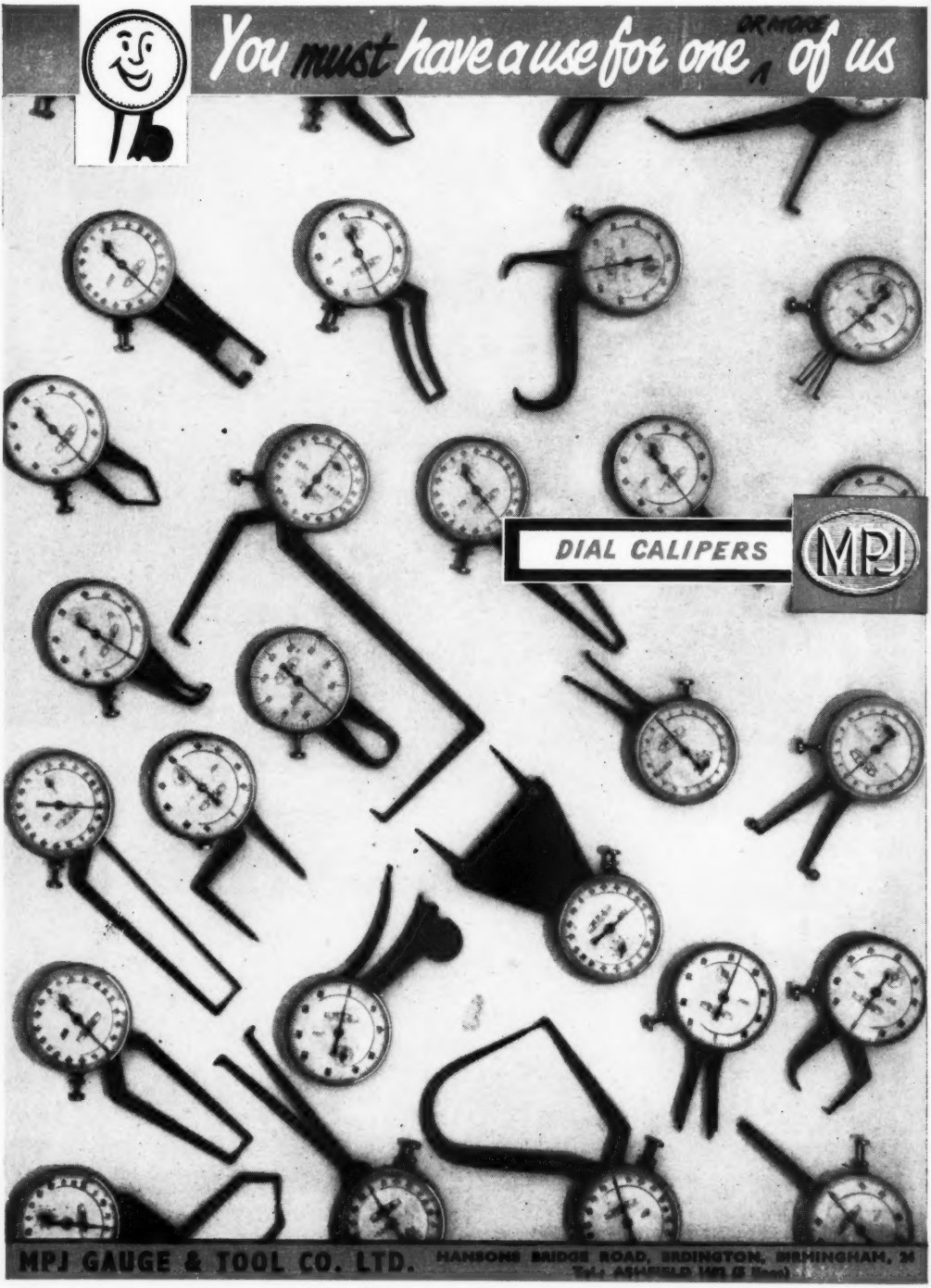
You must have a use for one OR MORE of us
DIAL CALIPERS
MPJ
MPJ GAUGE & TOOL CO. LTD.
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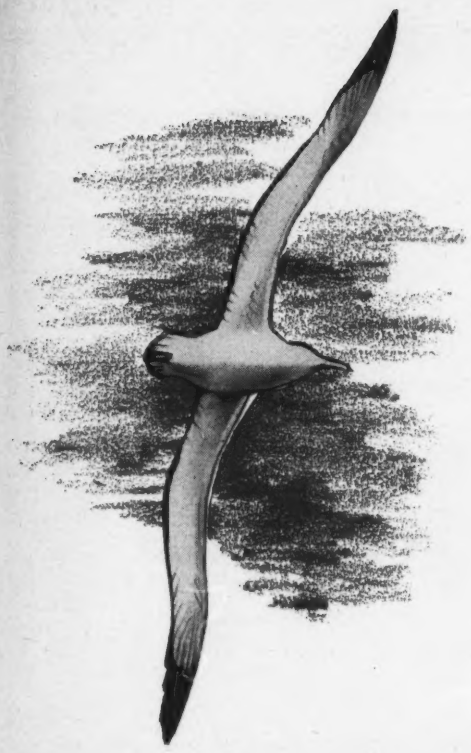

I travel alone

On and on . . . days and weeks at a time . . . through fair weather and foul . . . alone, but always safe and sure.

And, like the albatross, a Renold conveyor chain is very often alone too . . . because the maintenance engineer knows he needn't be in close attention once it has been installed. A Renold conveyor chain will go on and on for very long periods, free from breakdown and giving maximum service for minimum attention.

Write for Catalogue Ref. 120/19 giving full details of

RENOLD STOCK CONVEYOR CHAINS

WITH ATTACHMENTS FOR ALL DUTIES

RENOLD CHAINS LIMITED · MANCHESTER

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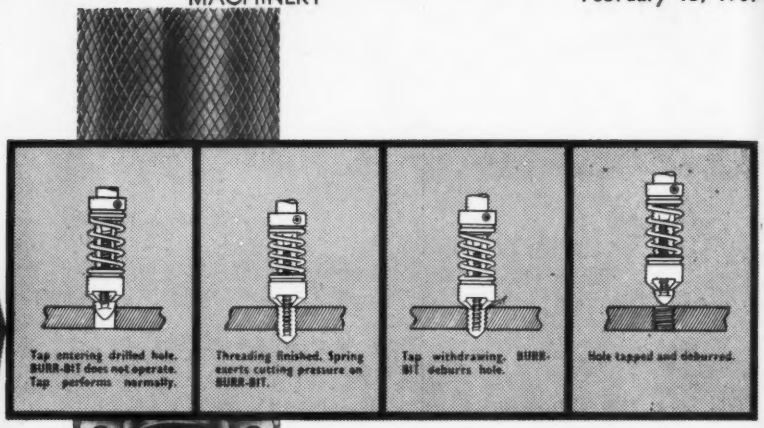
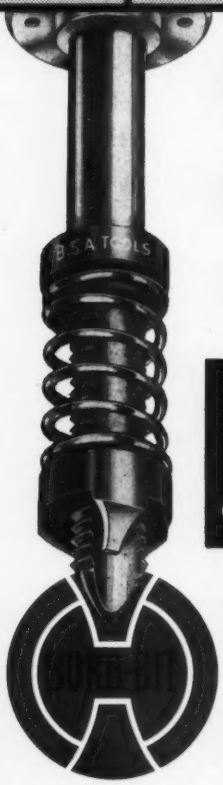
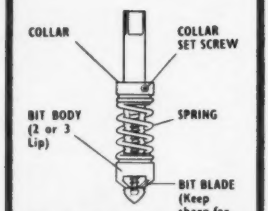
TAP AND DEBURR IN ONE OPN.


Tap entering drilled hole. BURR-BIT does not operate. Tap performs normally.
Threading finished. Spring exerts cutting pressure on BURR-BIT.
Tap withdrawing. BURR-BIT deburrs hole.
Hole tapped and deburred.





Fitted to the tap in seconds! Adjustable to suit thread depth.

For use with standard 2, 3, or 4 flute taps, on tapping machines, in tapping heads, on single and multi-spindle automatics, capstan and turret lathes.

For most materials—steel, cast iron, aluminium, brass, copper, plastics.

***SAVE** time, floorspace, manpower; **BURR-BIT** eliminates an extra machine, functions only as the tap is being withdrawn. No extra power is used.*

***CLEAN HOLES**—**BURR-BIT** chamfers while the tap is withdrawing, burr is not pushed into the hole.*

***AIDS ASSEMBLY** — **BURR-BIT** leaves clean thread lead. With burr removed parts are easily mated.*

B.S.A. BURR-BIT

deburrs & chamfers as tap withdraws

***IN THIN MATERIAL**—more full threads are left for gripping. **BURR-BIT** chamfers top thread only. For deep holes **BURR-BIT** is furnished with double conical spring.*

***NORMAL OPERATION** — **BURR-BIT** does not interfere with normal tapping or the accuracy of the tap.*

Literature on request

STOCKED IN THE TAP RANGE 6BA–¼"

Patent applied for

MADE BY B.S.A. SMALL TOOLS LTD
SPARKBROOK · BIRMINGHAM · ENGLAND

495

SOLE AGENTS U.K. BURTON GRIFFITHS & CO. LTD. MONTGOMERY ST. BIRMINGHAM 11

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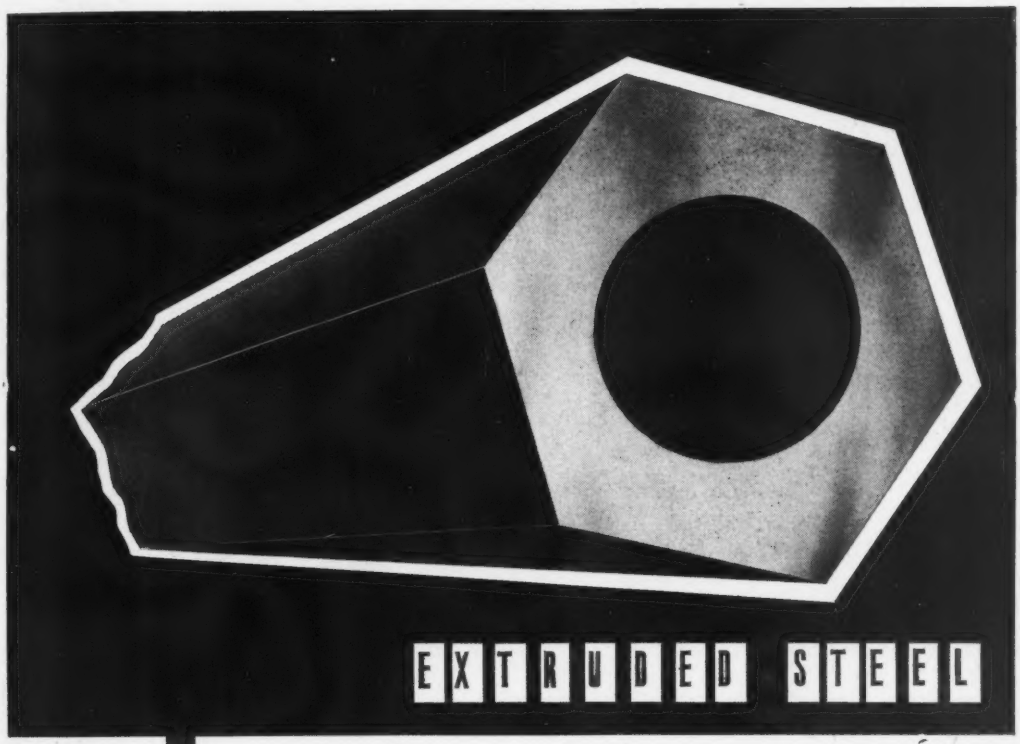


SECTIONS

Extruded steel sections are produced in most qualities of steel, including carbon and alloy steels, stainless steels and special alloys.

Hundreds of different shapes have already been extruded ranging from simple angles to most complex shapes. Physical properties are identical with similar rolled sections and extrusions can be supplied in random lengths of 8 to 30 feet with dimensional tolerances to suit requirements.

Send for further details of *Osborn* extruded steel sections and take the first step to lower costs by reduction of machining and elimination of scrap.

OSBORN

SAMUEL OSBORN & CO., LIMITED
CLYDE STEEL WORKS, SHEFFIELD
STEELMAKERS · STEELFOUNDERS · ENGINEERS' TOOLMAKERS

961

Fe

hopping for Solenoids

"Cynthia, darling, be reasonable; nobody told me Westool had such a whopping big range of solenoids, they simply said get Westool . . . they're so compact, utterly, utterly reliable. Seems they're tested and re-tested at every stage of manufacture. What a frightful bore! Still, I expect it's one reason why Westool solenoids are so jolly good. Steady, old girl! We shan't be long now, we've got the D.C. Pull and Thrust models, we've only to collect their A.C. Types. Cynthia—really!"

Westool solenoids, entirely self contained, can be fitted into any control system—remote, automatic or push button. Action instantaneous and certain. *Write for full technical details.*

WESTOOL

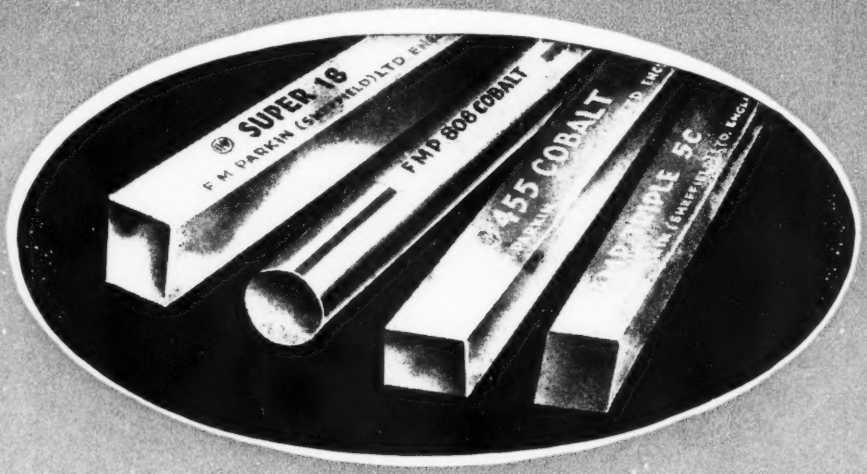
the best buy of all

WESTOOL LTD., St. Helen's Auckland, Co. Durham.
Telephone: West Auckland 551 (6 lines). Telegrams: Solenoids West Auckland.

LONDON: 2, Ashley Place, Carlisle Place, S.W.1. Telephone: Victoria 7301-2.

BIRMINGHAM: Silhill House, 2241 Coventry Road, Sheldon, Birmingham, 26. Telephone: Sheldon 5121-2.

WESTOOL LIMITED



★ HIGH SPEED STEEL

FMP

TOOL BITS

FOR IMPROVED PERFORMANCE ON ALL MACHINING OPERATIONS

SQUARES . . . . . $\frac{7}{16}$in. to 1in. BY 2in. to 10in. LONG
ROUNDS . . . . . $\frac{1}{8}$in. to $\frac{3}{4}$in. BY 2in. to 6in. LONG
FLATS . . 1in. by $\frac{7}{16}$in. to 1$\frac{1}{2}$in. by $\frac{3}{4}$in. BY 4in. to 6in. LONG

SUPER 18
FOR ALL NORMAL MACHINING. 18% TUNGSTEN CHROME-VANADIUM.

455 COBALT
SPECIALLY DEVELOPED FOR HIGH TENSILE MATERIALS. TUNGSTEN - CHROME - VANADIUM - MOLYBDENUM WITH 5% COBALT.

808 COBALT
FOR HIGH SPEEDS AND FEEDS ON DIFFICULT JOBS 10% TO 12% COBALT.

TRIPLE 5C
FOR NIMONIC AND HIGH TENSILE STEELS

LARGE STOCKS CARRIED INCLUDING METRIC SIZES ● TERMS TO STOCKISTS DEALERS AND IMPORTERS ● ALSO FORM TOOL TO CUSTOMERS' SPECIFICATIONS.

PARTING-OFF BLADES ... SUPER 18 GRADE
SHOT BLAST OR GROUND FINISH IN SIX SIZES FROM 6in. by $\frac{1}{16}$in. by $\frac{1}{16}$in. TO 1$\frac{1}{4}$in. by $\frac{1}{4}$in. by $\frac{1}{4}$in.

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F. M. PARKIN (SHEFFIELD) LTD.

ST. THOMAS STEELWORKS,
SHEFFIELD, 8, ENGLAND *Telephone: 50083 (5 lines)* *Telegrams: 'Sorbitic' Sheffield, 8*

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and 6/9, Red Lion Market, Whitecross Street, Finsbury, London, E.C.1 *Tel: Monarch 9102*

SCOTLAND AND NORTHERN IRELAND: W. C. WILLIS & CO. Ltd., 172/4, West Regent Street, Glasgow, C.2.
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Wickman

OPTICAL PROFILE GRINDING MACHINE

A machine of high precision capable of producing precise forms to the highest standard of accuracy. Designed to finish grind to fine limits any profile within its capacity and especially suitable for the accurate grinding of irregular shaped contours on flat or circular form tools, male and female profile gauges, punches and die segments in any material including tungsten carbide.

ACCURACY

Designed to finish grind to a plus or minus tolerance of 0.0005". With special care in producing the drawing, accuracy of 0.0002" can be obtained.

THE PANTOGRAPH

50 to 1 drawings are used in conjunction with the pantograph imparting a 50 to 1 reduction to its final area, this high reduction diminishes drawing error and imparts greatest accuracy to the finished form.

WORK CAPACITY

With the use of the pantograph the Optical Profile Grinding machine has a work range of 0.4" x 0.4". Utilising the work table slides the work capacity is 5⅞" x 2¼", maximum thickness 3".

MULTIPLE SLIDE WHEEL HEAD

This enables all types of angular forms to be ground with the utmost accuracy. By setting the upper head at the required angle marked on the circular guide, relief angles can be ground at the same time.

WORK ILLUMINATION

Ensures a clear image during all grinding operations. Two sources of work illumination are provided, surface illumination mounted in the projection unit for use with the microscope, and the projection illumination mounted at the base of the machine, for use with the projection screen. The focal length of the projection unit is fixed, ensuring a constant work image during grinding.

ATTACHMENTS

A full range of attachments and additional equipment is available covering every kind of form grinding likely to be encountered.

560 WM

WICKMAN LIMITED

Factored Machine Division

BANNER LANE, COVENTRY

Tel: Tile Hill 65231

NOBLE & LUND 'fluifeed'

MODEL AL/CC

COLD SAWING MACHINES

Designed out of forty years' experience, devoted to cold sawing problems, the Model AL/CC, with its proven "Fluifeed" hydraulic feed, ample power and "Insto" segmental saw, is setting up the highest standards of performance on bars, billets and sections.

7 STANDARD SIZES

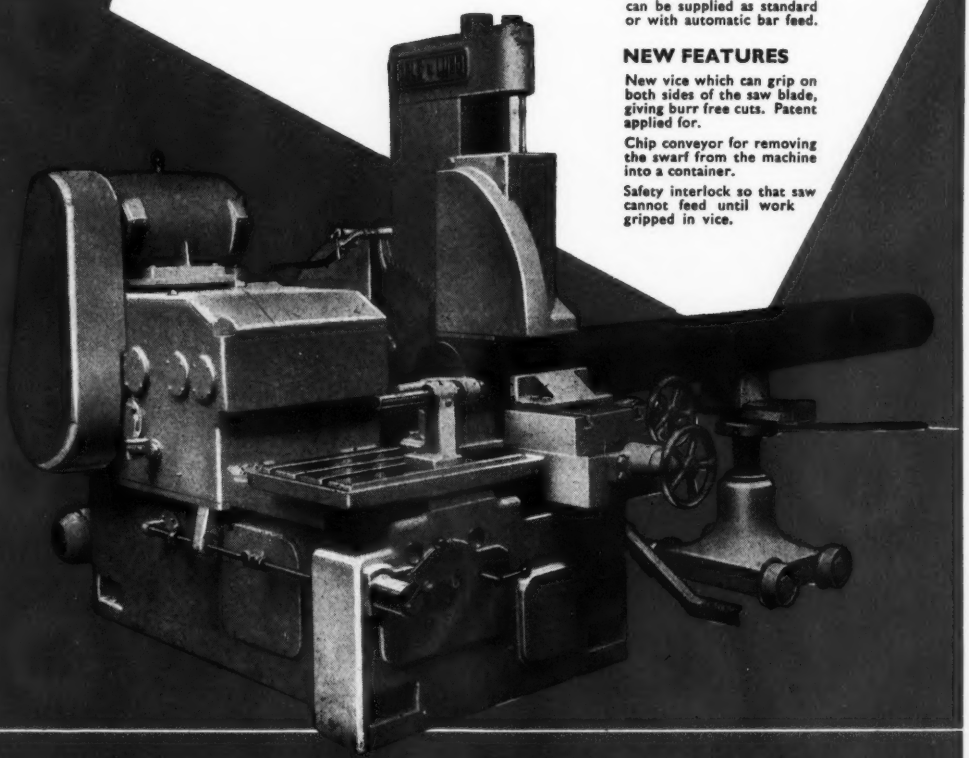
Saw blades from 11in. to 72in. dia. for sawing work 1in. to 26in. dia. Machines can be supplied as standard or with automatic bar feed.

NEW FEATURES

New vice which can grip on both sides of the saw blade, giving burr free cuts. Patent applied for.

Chip conveyor for removing the swarf from the machine into a container.

Safety interlock so that saw cannot feed until work gripped in vice.



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NORTHERN MACHINE TOOL WORKS PELLING-ON-TYNE

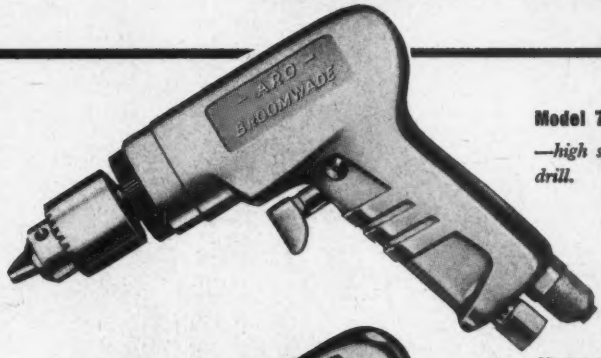
TELEPHONE: PELLING 69-2272 TELEGRAMS: LATHES, GATESHEAD.

1961

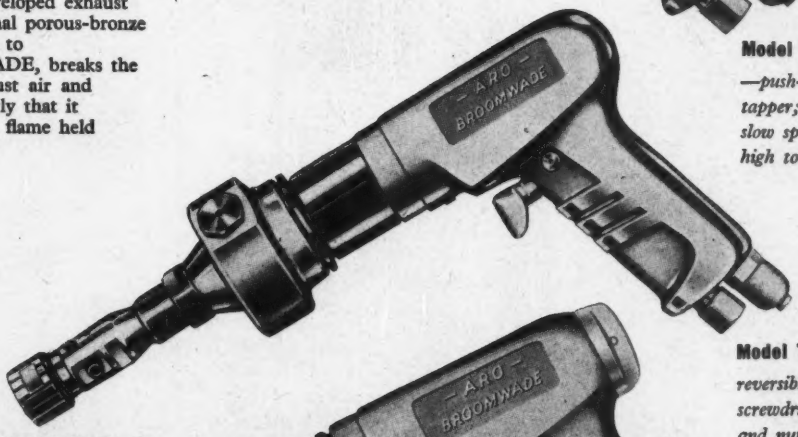
ARO-BROOMWADE
Golden Silence
PNEUMATIC TOOLS

MAXIMUM POWER
NO NOISE
NO BLAST

—these advantages are offered for the first time by the ARO-BROOMWADE Golden Silence range. The noise is destroyed by a specially developed exhaust system. An external porous-bronze diffuser, exclusive to ARO-BROOMWADE, breaks the force of the exhaust air and diffuses it so gently that it will not disturb a flame held only inches away.



Model 73880
—high speed drill.



Model 74290
—push-pull tapper; slow speed, high torque.

Model 72760
reversible screwdriver and nutrunner with adjustable clutch.

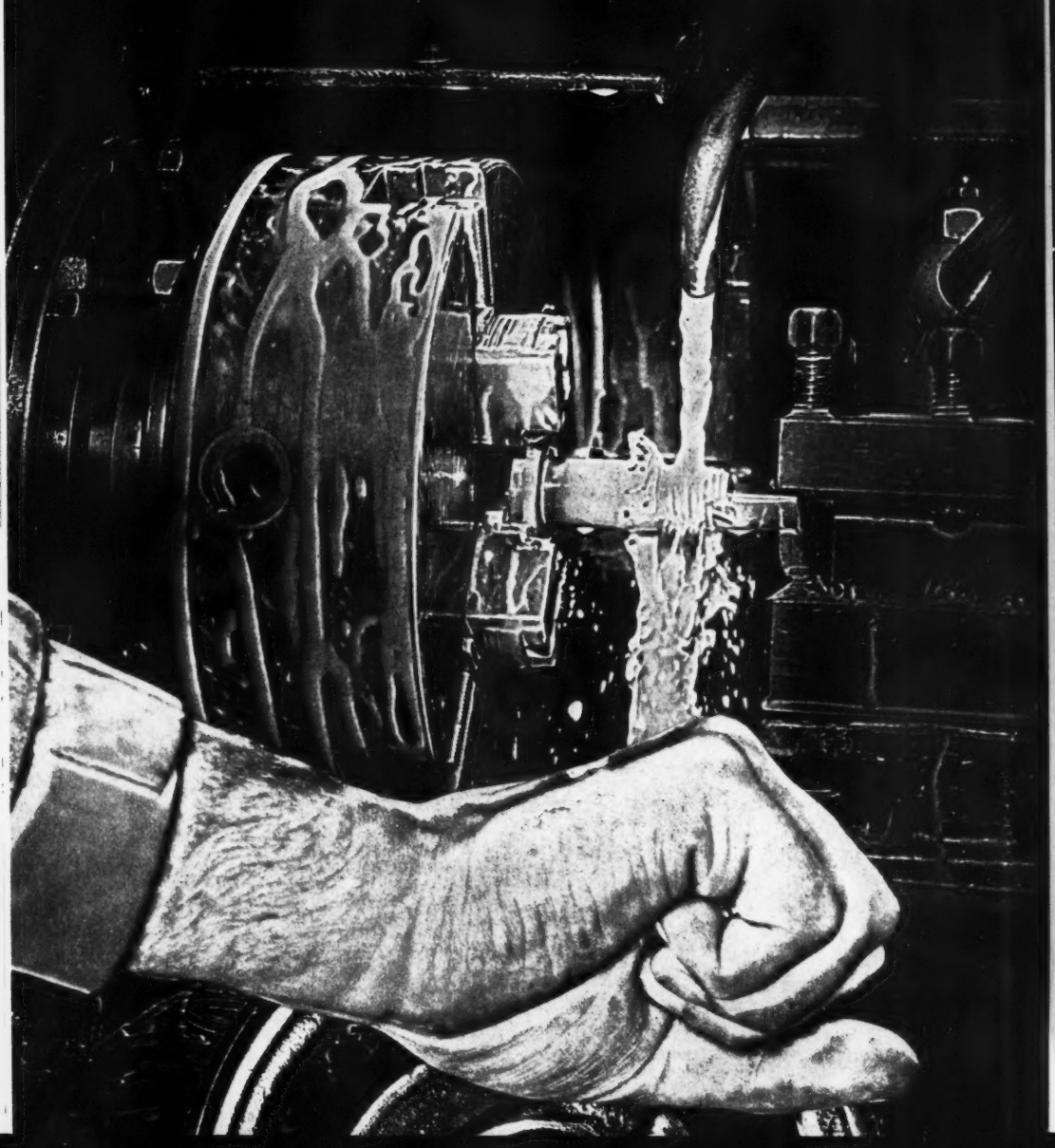
Only ARO-BROOMWADE Tools have GOLDEN SILENCE
Write for publication No. 444 T.E.

"BROOMWADE"
AIR COMPRESSORS & PNEUMATIC TOOLS
YOUR BEST INVESTMENT

BROOM & WADE LTD., P. O. BOX No. 7, HIGH WYCOMBE, ENGLAND
Telephone: High Wycombe 1630 (10 lines) *Telegrams: "Broom", High Wycombe (Telex)*

667 SAS

Greater safety for hands



ds

TRIUMPHS OF SHELL RESEARCH

With new Shell Dromus Oils

Most modern soluble cutting oils contain phenolic compounds used as coupling agents between the oil and the emulsifier, for better blending and easier mixing. These phenolic compounds can cause skin irritation, especially where modern high-speed machines are used and the emulsion can concentrate, through the evaporation of water, above the safety level.

Shell research chemists have been working on this problem, which has been causing some concern to Management. After considerable research, Shell Dromus Oils have been reformulated and these new cutting oils now produce bland emulsions, which considerably reduce the risk of skin trouble to operators.

The real difficulty was to find a new coupling agent to replace the phenolic compounds, and Shell finally used what their chemists know as a higher fatty alcohol complex. This solved one problem, but presented another. The new coupling agent was volatile at the high temperatures normally used in blending processes. Further research found a solution to this problem by designing and installing new plant.

The new Dromus Oils are every bit as efficient as before and cost no more. They put Management in the welcome position of being able to minimise working hazards at no extra cost. And machine men need no longer be so worried about skin troubles.

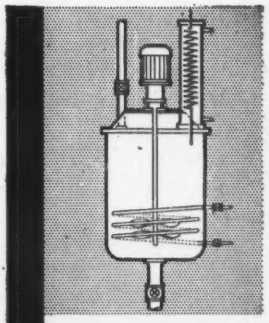
The moral of the story is that Shell research is supremely applicational. The centre at Thornton is always ready to work with even the most specialised sectors of industry to produce the right oil for the job. If you and your organisation have any major lubricating problems, it pays to get in touch with your local supplier of Shell Industrial Lubricants.

The Research Story

Shell chemists in the U.K., in Holland and in the U.S.A., prepared and examined hundreds of experimental soluble oils, and established that certain combinations of fatty alcohols could be used in place of phenolic compounds with no loss of efficiency. They set to work to discover the best combination and developed a higher fatty alcohol complex which fitted exactly. Then they realised that to blend this new coupling agent into soluble oils would require special plant and new blending techniques.

Exhaustive testing of blend stability, emulsion stability, anti-corrosion and machining properties led to selection of the most promising blends. A pilot plant was set up to produce batches of these for use in field trials.

This field testing and final development proceeded for two years whilst production plants were erected at points so chosen as to give the most economical and rapid delivery throughout the United Kingdom.



This is the blending kettle. The reflux condenser beside the stirrer motor prevents the loss of constituents volatile at the blending temperature.

NEW SHELL DROMUS SOLUBLE CUTTING OILS

another proof of Shell leadership in lubrication

MACHINE TOOL DIRECTORY

FOR HIGHER PRODUCTION

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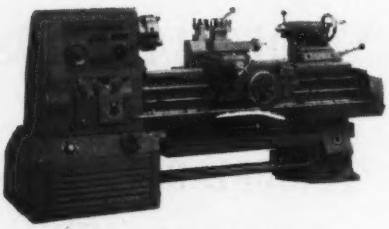

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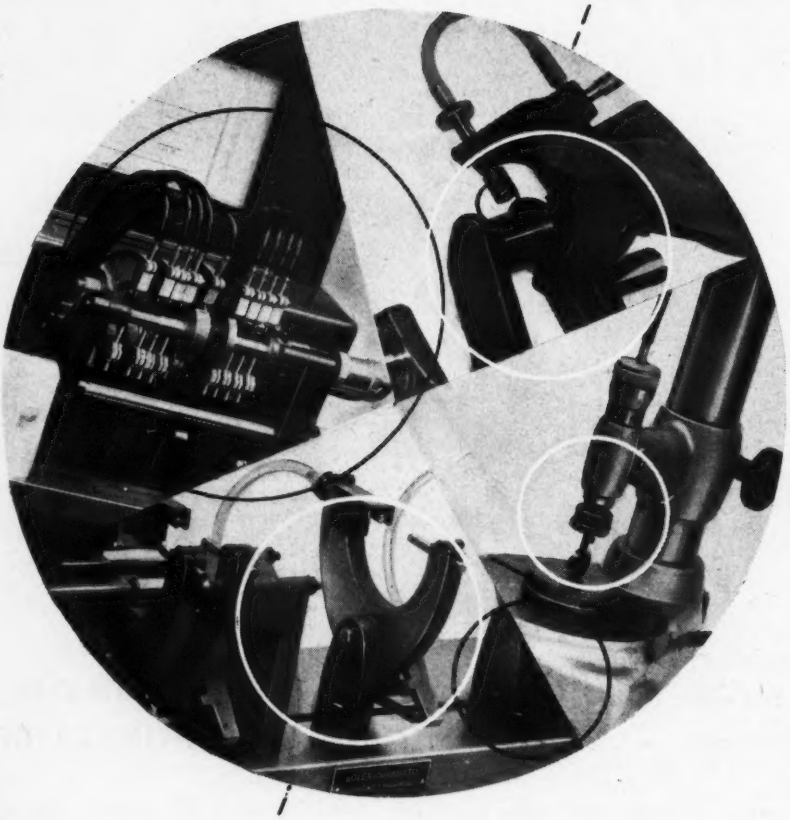

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Abstracts of Principal Articles

The Production of F.H.P. Electric Motors P. 348

The Cambuslang factory of Hoover (Electric Motors) Ltd., which is stated to be the largest of its kind in Europe, is equipped and organized to produce f.h.p. electric motors at the rate of one every 4 sec. Laminations are produced on 5-stage " scrapless " press-tools, and are annealed in a large Birlec tunnel furnace. Stacking of the stator laminations for Mark II motors is facilitated by the use of a special fixture. The shells for these motors are die cast round the stator laminations, and the conductor-bars and end-rings of the squirrel-cage rotors are also integrally die cast. Serrations are produced on rotor shafts by a knurling process, and at a set-up on a Scrivener 2G centreless machine, seven shaft-diameters are ground simultaneously. H.F. induction heating equipment is used to heat Mark II rotor-stacks for shrinking them on to the shafts, which are subsequently ground. A centreless grinder, adapted for plunge grinding, is employed for rotor-shafts for type A.C. 14 washing-machine motors. (MACHINERY, 98—15/2/61.)

Use of Wax for Holding Honeycomb for Machining .. .. P. 359

Honeycomb material is machined in large quantities at the works of Temco Electronics & Missiles Co., U.S.A., for a variety of components incorporated in aircraft and missiles. It is held during machining with the aid of water-soluble wax, which is poured into the honeycomb at 145 deg. F., and solidifies at 110 deg. F. For cutting the honeycomb, a planer has been adapted to incorporate a bandsaw at the rear of the cross-rail and an Onsrud milling head, with an 18-in. diameter disc-type cutter, in place of the normal planing tool slide. As the table is traversed, a roughing cut is taken by the bandsaw and the material is then machined to finished size by the disc-type cutter. (MACHINERY, 98—15/2/61.)

Painting and Assembling Domestic Lawn Mowers .. .. P. 362

In this fourth and final article on the production of Conquest and Sprite lawn mowers at the works of Ransomes, Sims & Jefferies, Ltd., Ipswich, details are given of the equipment employed for pre-treating and spray-painting the various components. The two types of machines are assembled at different sides of a common slat-type conveyor, and reference is made to various types of assembly fixtures and procedures which are employed. (MACHINERY, 98—15/2/61.)

Some Examples of Machining Operations and Tools Employed on Aluminium Cylinder Blocks .. .. .. P. 369

The V-8 engine for the 1961 Buick car incorporates an aluminium crankcase and block, with cast-iron cylinder liners cast in position, and wherever practical and economical the manufacturing equipment formerly employed for operations on cast-iron engines has been adapted for the new unit. Of 14 major machining units in the production line, only three are new. This article described various set-ups, including the special cutters for taking combination cuts on aluminium and cast iron and unusual drills for machining deep oil gallery holes. Another interesting feature of the production line is the inclusion of a special press, supplied by the Detroit Broach & Machine Co., which is used for inserting the camshaft bushes. (MACHINERY, 98—15/2/61.)

Reversible 2-speed Geneva-drive Mechanism .. .. P. 383

This article describes an ingenious mechanism, incorporating a Geneva plate, which was designed to impart a series of angular movements to a prism in a proposed type of aerial camera. The prism is required to rotate 60 deg. in an anti-clockwise direction, pause, rotate a further 60 deg., in the same direction, pause, and finally rotate 120 deg. in an anti-clockwise direction. Drive to the mechanism is taken from a constant speed uni-directional electric motor. (MACHINERY, 98—15/2/61.)

Wiest Universal 6-spindle Drum-type Indexing Machine .. .. .. P. 384

The machine here described is intended for operations on valve bodies, pipe fittings, and other components in steel and non-ferrous materials on which machining is to be carried out on three sides. It incorporates an indexing drum, rotating about a horizontal axis, and has a number of unit heads arranged for turning, boring and threading duties. (MACHINERY, 98—15/2/61.)

Continuous Casting of Aluminium Bar P. 390

Equipment has been developed for continuous casting aluminium bar of 2¼ in. diameter at the rate of 80 in. per min. Sectional views are included of the pouring trough, nozzle, and mould of the machine, and full details are given of its operating sequence. (MACHINERY, 98—15/2/61.)

Contributions to MACHINERY

If you know of a more efficient way of designing a tool, gauge, fixture, or mechanism, machining or forming a metal component, heat treating, plating or enamelling, handling parts or material, building up an assembly, utilizing supplies, or laying out or organizing a department or a factory, send it to the Editor. Short comments upon published articles and letters on subjects concerning the metal-working industries are particularly welcome. Payment will be made for exclusive contributions.

EDITORIAL

Broken Delivery Promises

When addressing the Midland Regional Council recently, Sir William McFadzean, president of the Federation of British Industries, made a special appeal to chairmen and managing directors of manufacturing and contracting companies, and to all others concerned at different levels, to make greater efforts to ensure that delivery and completion promises are observed. In particular he was concerned with the effects of broken promises on the export drive, of which, he said, there had been a growing number of reports in recent months. Many British companies had established reputations for completing contracts and delivering goods not only on time, but often in advance of the stipulated dates. Where there were failures in this respect, however, harm was done not only to the companies concerned but to other British exporters. "Unfortunately a reputation for late delivery spreads far more quickly and widely overseas than a reputation for contracts ably fulfilled to the letter." Sir William freely admitted that the United Kingdom was not the only country that was at fault in this respect. There were many similar complaints of broken delivery promises by overseas competitors. Such failures, however, should never be accepted as excuses for our own shortcomings, but should rather be regarded "as opportunities of which we should take full advantage."

The effects of late delivery may be particularly serious where the orders are for manufacturing plant and machinery for new factories overseas, since delays are likely to dislocate the entire programmes for starting production. Special attention to contract terms is therefore desirable in this field, and particularly on account of the success that has so far been achieved in expanding exports of machinery during the post-war years, and the excellent prospects that exist for further progress in this direction.

As has been indicated, Sir William was primarily concerned with export trade, which is admittedly of vital importance. The effects of delays and uncertainties in connection with deliveries, however, may also seriously influence the efficiency of operation in many factories which produce wholly or principally for the home market. The ramifications of supply in industry are often very complex, and a company which is arranging to introduce a new product may be dependent, for example, on the promises of suppliers of standard or special machines, tooling to be made under contract, numerous materials, and a variety of proprietary components to be incorporated in the assembly. If any one item is not available at the appointed time, or is not forthcoming in sufficient quantity, it may be necessary to defer the whole programme, or to start production on batches of uneconomical size.

At the same time, it must be borne in mind that every one of this hypothetical company's suppliers may, in turn, be dependent on a number of other firms, and so on. It is not difficult, indeed to imagine that a situation might arise, for instance, where a particular company was complaining bitterly on account of the delay in the delivery of certain gears. If the matter could be thoroughly investigated, however, it might be found that the company which was awaiting the gears was itself largely responsible for their non-appearance through having failed to supply on time, some months before, castings ordered by some organization which seemed to have no connection at all with the final transaction.

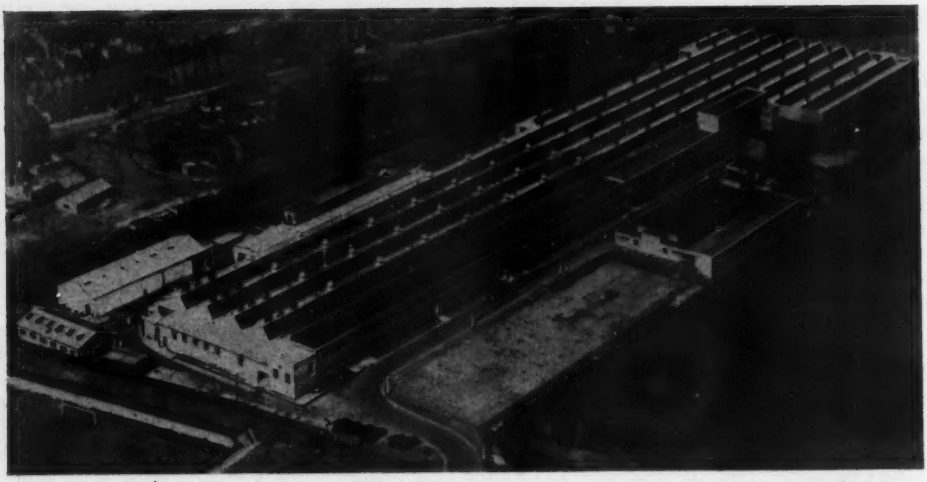
Assuming that, in general, when a company accepts an order there is a genuine intention to observe the delivery conditions, as a rule it is only too easy to find an excuse for failing to do so, and often the blame is conveniently laid at the door of a third party.

A firm cannot, however, divest itself of responsibility merely by saying that it has been let down by X, Y, and Z. In general, it is suggested, this whole question of broken delivery promises should be regarded much more seriously throughout industry than it sometimes appears to be. If the fault is found to lie within an organization, the system which forms the basis for acceptance of orders and delivery promises should be the subject of critical examination.

On the other hand, if the trouble can fairly be attributed to a delinquent supplier, every reasonable pressure should be exerted before defeat is admitted. Such a course may inevitably involve much unnecessary expenditure of time and effort, and the degree of success that can be expected will depend to a considerable extent on individual circumstances.

There is, too, another side of the picture which must not be overlooked. In order to secure an important contract, perhaps for export, a company may make insistent demands on its suppliers for delivery promises which they are reluctant to give.

(*Continued on page* 400)



The Production of F.H.P. Electric Motors

Methods Employed by Hoover (Electric Motors), Ltd., Cambuslang

By S. C. POULSEN, Associate Editor

AT THE FACTORY OF HOOVER (ELECTRIC MOTORS), LTD., Cambuslang, Lanarkshire, Scotland, which is claimed to be the largest of its kind in Europe, the capacity is such that f.h.p. electric motors can be produced at the rate of one every 4 sec., throughout the working day, and the present total of employees is approximately 1,600. Since the factory was opened in 1946, the demand for these products has steadily increased, and an extension to the premises is now under construction. The existing floor-area is 170,000 sq. ft., and the extension will provide an additional 80,000 sq. ft.

A major proportion of the output is accounted for by a variety of motors, including universal and shaded-pole types, for the extensive range of Hoover domestic products, and notably for the Hoover washing-machine factory at Merthyr Tydfil, Glamorgan (MACHINERY, 87/996—28/10/55). Some of these motors are also supplied to other manufacturers, for certain specialized applications, where standard industrial motors may not be satisfactory. The remainder of the output comprises the firm's Mark II and Mark IV industrial motors, typical examples of which are shown in Fig. 1, at the left and right respectively. These motors are of the squirrel-cage induction type, and are available in various capacities from ¼ h.p. to ½ h.p.

The Cambuslang factory is equipped and organized for high efficiency in operation, and particular attention has been paid to the attainment of adaptability, to enable changes in product-design to be accommodated without impairing output. Adaptability is also necessary to cater for the wide range of variants of each type of motor, involving the many different combinations of such characteristics as voltage, phase, shaft arrangement (single-ended, double-ended, keyed, or plain) and mounting arrangement. This range is further complicated by the necessity for complying with the electrical and other requirements of different countries, including, in a number of instances, metric dimensions, to meet the needs of export markets throughout the world.

The Mark II and Mark IV motors are available in three basic types, namely, single-phase split-phase, single-phase capacitor-start, and 3-phase, all of which are manufactured in drip-proof ventilated, and totally-enclosed forms. Alternative mounting arrangements for both Mark II and IV motors include solid foot, resilient, flange, and lug designs.

In addition, Mark II motors are available with a resilient mounting that incorporates an automatic belt-tensioning device. Among the main differences between the Mark II and Mark IV motors, is the design of the shell. Whereas the Mark II motor has a die cast aluminium-alloy shell, with cast-in field laminations, and is of comparatively massive construction, the Mark IV is designed to provide a lighter, cheaper unit of comparable performance, and has a cylindrical steel shell.

PRODUCING THE LAMINATIONS FOR ELECTRIC MOTORS

The various motor laminations are produced on Bliss type 675 H.P. 93-ton presses, which operate at speeds up to 180 strokes per min. Wherever possible, for the sake of material economy, so-called "scrapless" tools are employed. The application of these tools is related to lamination design, since a basic requirement for maximum material utilization is that the external profile of the stator-laminations shall incorporate at least two—and preferably four—straight sides, with circular portions of minimum extent. With a four-sided outline, the tools can be arranged so that two of the sides are formed by the edges of the strip, and the other two by the line on which each successive blank is cropped from the strip. Thus, when such a set of tools is also designed to blank a rotor-lamination from the centre of each stator-lamination, the only scrap, apart from that associated with slots and holes, comprises the small cusp-shaped pieces between the circular "corners" of each adjacent pair of components, and the tools are then termed "scrapless." In addition to minimizing scrap, this system also reduces the load at the final blanking or cropping stage.

Laminations for the Mark II motors conform to this "ideal" configuration, and typical tool design policy is exemplified by the corresponding tools, which are shown in Fig. 2. In accordance with this policy, they are arranged for 5-stage operation, stages (1) and (2) being concerned with rotors, and (3), (4) and (5) with stators, as follows. (1) Pierce shaft hole 0·875 in. diameter, seven ventilation holes ¾ in. diameter, and 48 conductor slots. Also pierce two $\frac{7}{16}$-in. diameter pilot holes. (2) Locate by shaft hole and pilot holes, and blank rotor. (3) Locate by pilot holes and pierce 36 stator slots. (4) Crop side-notches. (5) Locate by pilot holes, and blank stator from end of strip. Remove scrap by air-jet. These laminations, it may be noted, are of bright semi-hard lamination steel, with a hardness value of 130 to 150 V.P.N., and the press is run at 140 strokes per min.

As may be observed in Fig. 2, stripping is effected by means of fixed stripper-plates. The locating pilots are spring-loaded, so that the tools will not be damaged by mis-feeds, and spring-loaded pins are provided on the bottom faces of the larger-section punches, to avoid adhesion of the blanks. Where the cross-section of the punch is too small to accommodate such an arrangement, a similar duty is served by a ⅛-in. diameter rubber insert, as seen in one of the stator-slot punches at *A*. To ensure that the strip does not jam in the

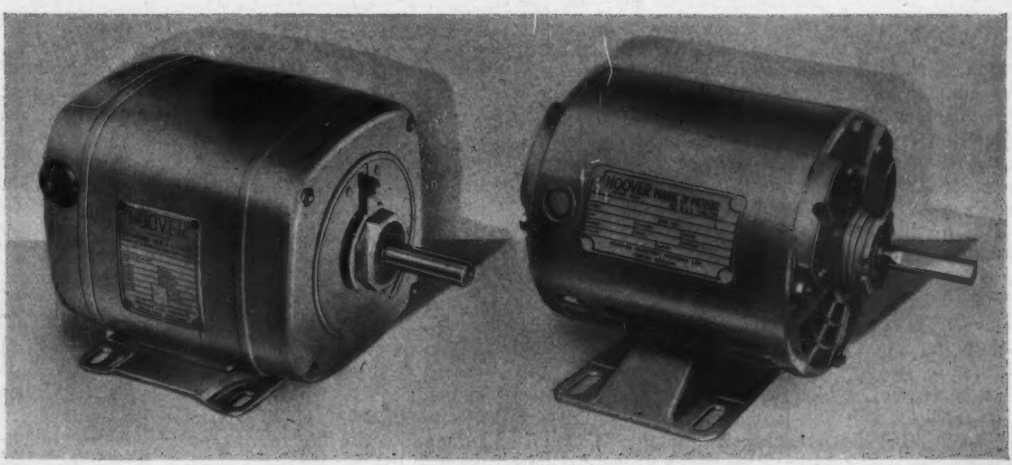


Fig. 1. Hoover Mark II (left) and Mark IV industrial f.h.p. electric motors. These motors are available in capacities of ⅛ h.p. to ½-h.p., with many variants

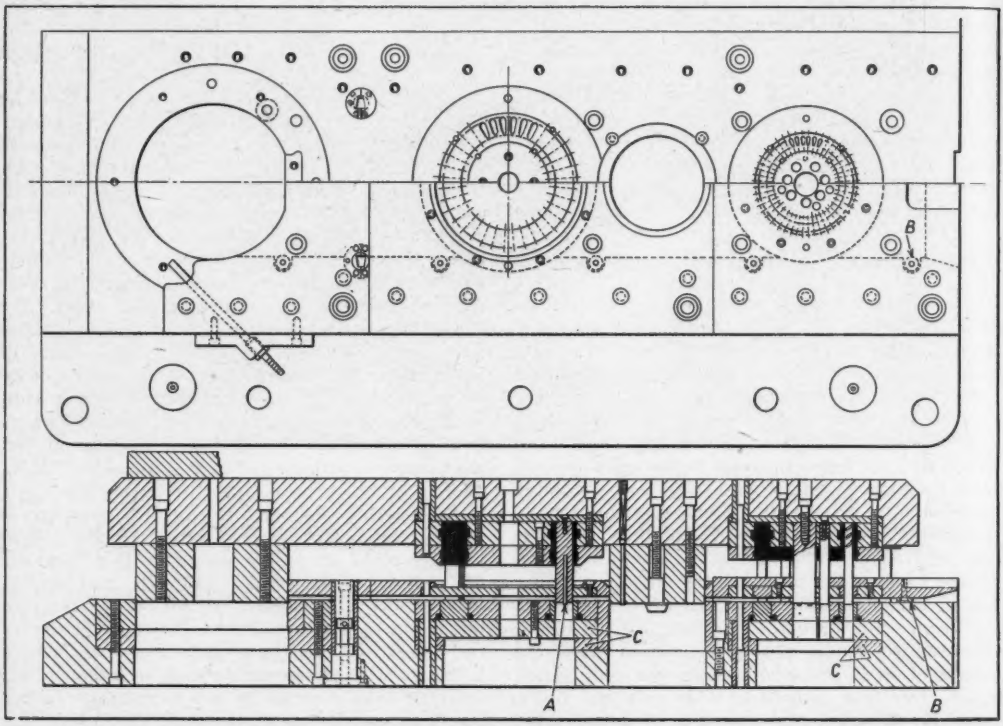


Fig. 2. Typical "scrapless" 5-stage press-tool, for producing Mark II rotor and stator laminations, at the rate of 140 per min. The piercing dies are of segmental construction

guides, the latter are provided with the rollers *B*, at intervals throughout their length.

Whereas the various punches are designed to last for the entire life of the tools, the corresponding die-units are replaceable. At the piercing stations, namely, (1) and (3), the die-units are of segmental construction, with segments of Kayser Ellison's K.E. 970 high-duty (2 per cent carbon, 14 per cent chromium) tool steel, hardened to 60 to 62 Rockwell C. Each set of segments is contained in a shrink-ring, and the punches are of similar material. Initially, each such die-unit is ¾ in. deep, and is supported on two packing pieces, as at *C*, the lower of which is 0·45 in. thick. At each regrind, which is carried out after every 75,000 to 100,000 laminations, the entire top face of the die assembly is ground. This procedure is continued until the depth of the die-units has been reduced to approximately 0·3 in.

When this stage is reached, the die-units and the lower packing pieces *C* are discarded, and new die-units are fitted. The full ¾-in. depth of the new die-units is thus accommodated, so that the upper faces are flush with the die face, and no other new parts are required. Thereafter, at each regrind, the entire top face is ground, as before, and by the time the die-units have again been reduced in depth to 0·3 in., the end of the useful life of the tools has been reached, and they require replacement.

Initially, it is arranged that the clearances between the punches and dies at the first and third stations are maintained within a total of 0·0005 in., and at the blanking stations (second and fifth) within a total of 0·001 in. The dies have a draft angle of ¼ deg., which ensures that the laminations are within 0·001 in. to 0·0015 in. of nominal size throughout the life of the tools. Accurate alignment of the various tool elements, during assembly, is facilitated by the use of Cerromatrix (shown solid black in Fig. 2) and the guide-pillars and sleeves are of the ball-bush type.

A typical press set-up, for producing laminations with a 5-stage scrapless press-tool, is shown in Fig. 3. The coiled strip is fed to the press from the B.H.P. de-coiling and straightening unit (B.H.P. Machine Tool Co., 91 Wattville Road, Birmingham, 21) seen in the right foreground. In this unit, the coil rests on a short length of endless "caterpillar" track. This track comprises a series of aluminium crossbars, and is driven at a controlled speed in unison with the straightening rolls. The speed of the rolls and track is steplessly variable, and the de-coiler unit is set to run very slightly faster than the press, which is equipped with a roll-feed attachment. Automatic control is obtained by means of a follower-arm and roller, with an associated switch, which is actuated by the loop of slack between the unit and the feed-rolls. Since the coil is driven by friction, at the periphery, the strip is unwound at a constant rate despite the reduction which occurs in the size of the coil.

As the stator and rotor laminations are ejected from the bottom of the tools, they are discharged into separate curved chutes, which may be seen at *D* in Fig. 3. These chutes are attached directly to the under-side of the press table, and are inclined upwards at the outer ends.

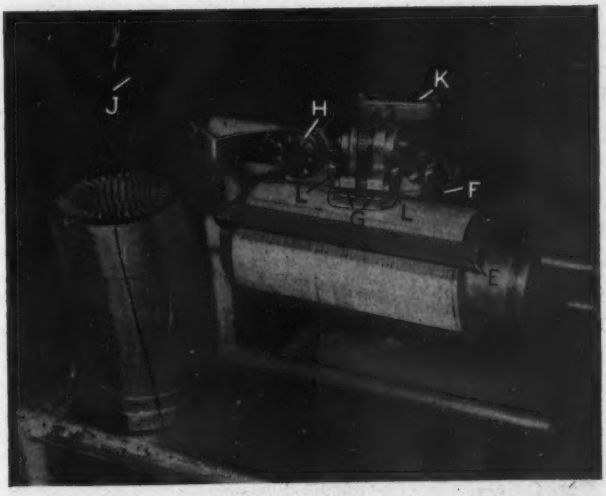


Fig. 4. Simple fixtures, of the design here shown, are used to facilitate the stacking and wiring of stator laminations, at the rate of 25 sec. per stack

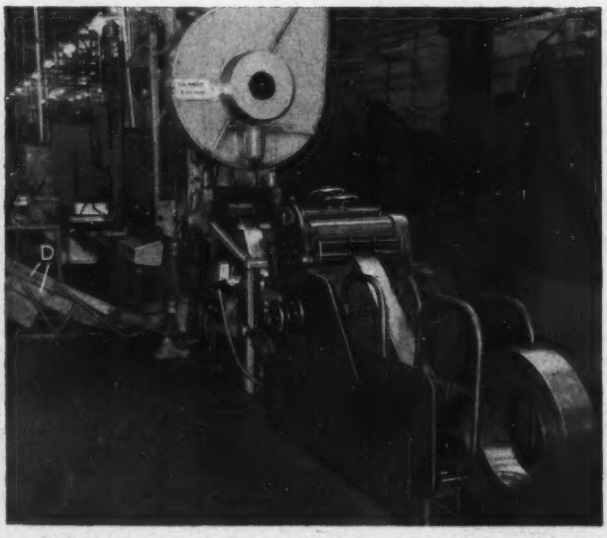


Fig. 3. Typical set-up on a Bliss type 675 H.P. 93-ton press, for producing stator and rotor laminations, showing the B.H.P de-coiling and straightening unit

The ejected laminations are allowed to accumulate in the chutes so that they form continuous stacks. Thus, as each lamination is ejected from the tools, the entire stack is urged towards the delivery end of the chute by a corresponding amount, and a uniform orientation of the laminations is automatically maintained throughout the stack. If the chute is completely emptied at any time, it is necessary to re-establish this condition—as distinct from free fall and random orientation—by placing a sliding weight, with a sufficient number of laminations above it, at the lowest point in the chute.

This sliding weight serves to compensate for the absence of laminations in the inclined delivery portion of the chute, so that when further laminations are produced, they are automatically stacked correctly. Eventually, the weight is discharged from the delivery end of the chute, by the advancing stack of laminations.

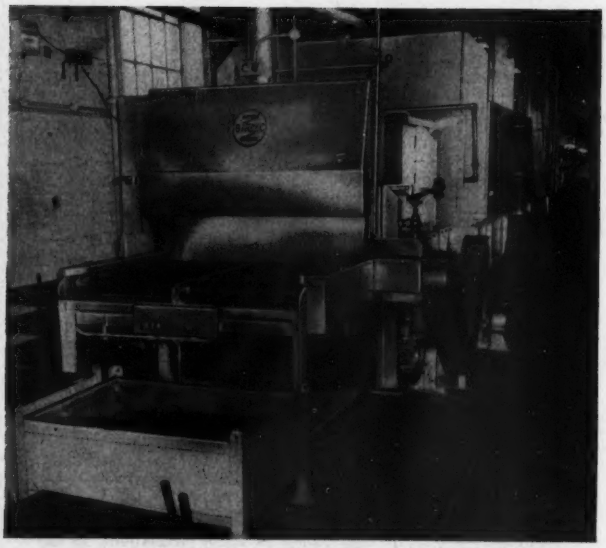


Fig. 5. Annealing of the laminations is carried out in this large Birlec tunnel furnace, in a neutral to slightly reducing atmosphere of partly-burnt town's gas

The delivery end of each chute is at a convenient height for unloading, and the press operator periodically removes a batch of approximately 500 to 550 laminations at a time, and slides them over a mandrel on a special stacking and wiring fixture of the design shown in Fig. 4. This fixture incorporates a wire twisting and cutting-off machine (Strappings, Ltd., Gordian House, Aintree Road, Perivale, Greenford, Middlesex) and in the particular example seen, which is for stator laminations, the orientation of the laminations is maintained by the flat bar *E*. On the corresponding fixtures for rotor laminations, a similar duty is served by a rod that engages the ventilating holes.

When the fixture has been loaded, a length of wire is drawn from a coil, and "kinked" over the blade seen at *F*. It is then slid between the jaws *G*, and the free end is inserted through one of the slots in the stack, from the left-hand end as viewed in Fig. 4. The free end is next doubled back along the outside of the stack, slid between the jaws *G*, and anchored by passing a quarter-turn round the grooved periphery of the disc *H*, where it is finally inserted in one of the diametral pairs of slots in the face of the disc, as seen. Thereupon, the operator tensions the wire by thrusting the lever *J* upwards, and then pulls the second lever *K* towards him. This second action twists the wires together, and cuts off the surplus on either side of the twist, by means of the blades *L*. With this equipment, each batch of laminations can be stacked, and wired on two sides, in 25 secs.

HEAT TREATMENT

Stacking and wiring of the laminations, as described, is carried out in preparation for annealing heat treatment, in the Birlec controlled-atmosphere tunnel-type furnace shown in Fig. 5. In the heating and cooling sections of the furnace, a neutral to slightly reducing atmosphere is maintained by a supply of partly-burnt town's gas, provided by an atmosphere generating plant which is fed with town's gas and air, in the proportion of 1:3·8. The stacks of laminations are loaded on to trays, each 3 ft. long and 2 ft. wide, which are carried through the various zones of the furnace in pairs, side by side, on power-driven conveyor rollers.

The total duration of the heat-treatment cycle is approximately 12 hours, and although the temperatures employed at the different stages are varied slightly, according to the specification of the lamination material, the cycle is basically as follows. First, the work is heated to 750 deg. C., over a period of two hours, and is then "soaked" at this temperature for one hour.

Next, the work is allowed to cool at a slow, uniform rate, to 600 deg. C., under controlled conditions, for 7 hours, followed by further cooling, to 500 deg. C., during one hour. At the end of this period, the work enters an air-cooled section of the furnace, and here, still protected by the neutral atmosphere, it is rapidly cooled to 350 deg. C. to 400 deg. C., over a period of one hour. Finally, it is discharged from the neutral atmosphere at this temperature, on to a run-out table at the delivery end of the furnace, whence it is unloaded, and allowed to cool and oxidize in air, to room temperature. Two trays of laminations are unloaded from the run-out table every 25 min.

LAMINATION STACKING AND DIE CASTING

To facilitate the stacking of Mark II stator laminations, in preparation for die casting the aluminium shells, the equipment shown in Fig. 6 is set-up on a 12-ton Hi-Ton hydraulic press. The fixture seen at the right on the machine table is

designed to locate the laminations by the circular "corners" and two flats, and in the bottom, there is a spring-loaded pad on which the stack of laminations rests. A stack of approximately the correct number of laminations is loaded into the fixture, which is then slid forward beneath the ram of the press, against a stop. When the press is operated, a pad on the end of the ram engages the top of the stack, thereby thrusting it, and the spring-loaded pad at the bottom, downwards, until a projection *M*, on the edge of the pad, engages the stop *N*. The stack is thereby tightly clamped, by the pressure of the springs below the bottom pad, so that air is expelled from between the laminations, and the true height of the stack can be ascertained.

For this purpose, a pointer *P* is actuated by the bottom pad, and, in conjunction with a scale, serves to indicate, directly, the number of laminations that must be added to the stack, or removed from it, to give the correct "clamped" height. The press ram is then raised, the fixture is withdrawn, and the necessary number of laminations is added or removed, as required. Next, a locating key is inserted in one of the winding slots, to ensure that all the slots are accurately aligned, and the mandrel *Q* is then pressed home in the main bore, in readiness for die casting.

Die casting of the shells, round the stator laminations, is carried out on a Daniels 75-ton special-purpose machine, with the single-cavity dies shown in Fig. 7. These dies are designed to locate the laminations by the mandrel, and to clamp them axially during the injection and cooling of the casting metal. Initially, molten aluminium is ladled into the bottom die half, whence it runs into an injection sleeve below. The work is placed in the bottom die and when the automatic cycle is initiated the dies are closed and the metal is injected. When the dies are opened, the upward travel of the injection plunger is continued, so that the work is ejected.

Fig. 7. Mark II shells are die cast round the stator laminations on this Daniels machine

Fig. 6. Stacking of the stator-laminations for Mark II motors, in preparation for die casting, is carried out at this set-up on a 12-ton Hi-Ton hydraulic press

On removal, the work is immediately returned to the station seen in Fig. 6, where it is placed in the fixture *R*, at the left, and the mandrel is removed by thrusting it out with the ram of the press. The mandrel passes through an aperture in the press table, and is caught in the chute seen below.

While the work is still hot, a sizing plug is dropped into the stator bore, and the work is set aside to cool. A typical die cast stator, with a sizing plug in position, is seen in Fig. 7, in which may also be observed the internal details of the casting,

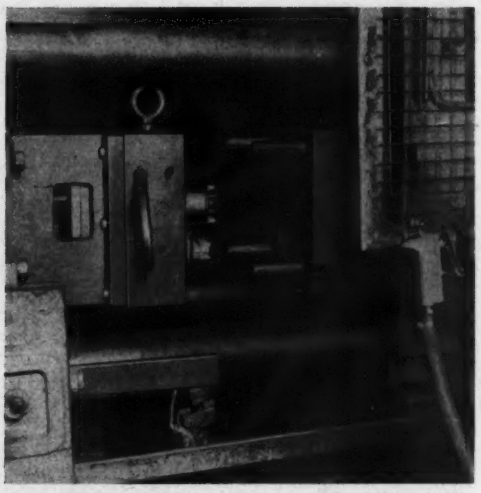


Fig. 8. Mark II rotors are die cast on 250-ton Reed-Prentice machines, as here shown

whereby the laminations are retained and clamped. This clamping effect is enhanced by the greater coefficient of thermal contraction of aluminium, as compared with that of the lamination material. Similarly, as the work cools and contracts round the sizing plug, the edges of the laminations are trued by the plug, so that an accurate bore is obtained. Also, when the plug is finally pressed out, once the work has completely cooled, the edges of the laminations are slightly burnished. All the foregoing duties are shared between two operators, whose joint output is 30 to 40 stator assemblies an hour.

ROTOR STACKING AND DIE CASTING

The rotors of the various induction motors produced have aluminium conductors, which are die cast integrally with the end-rings and cooling vanes. Lamination stacking and die casting are carried out by methods generally similar to those described for the stators, and 250-ton Reed-Prentice horizontal cold-chamber machines are employed. Whereas the Mark II rotors are cast in 2-cavity dies, rotors for other types of motors are cast in single-, 2- or 3-cavity tools. A typical set of dies for Mark II rotors is shown in Fig. 8, in which a pair of rotors, immediately after die casting, is seen in position in the movable die half, with the slug and runners still attached to the end-rings.

Removal of the lamination stacking mandrels, and trimming, to remove the flash and runners, are carried out simultaneously on a 12-ton Hi-Ton hydraulic press, by the operator of the die casting machine, during the cooling stage of the casting cycle. For this purpose, a fixture is mounted on a slide on the press table, so that it can be withdrawn from beneath the ram, to facilitate loading. On the upper face of the fixture, there are two cylindrical cups that serve to locate the two die-cast rotors vertically, by the lower ends, with the feeders and slug projecting horizontally from the upper ends.

A pair of hollow punches is mounted on the press ram, at the same centre-distance as the cups, and in the centre of each, there is a longer solid punch, slightly smaller in diameter than the lamination mandrel. When the loaded fixture is moved to the working position, against a stop, and the press is operated, the central punches engage the upper ends of the mandrels, so that the latter are ejected. Towards the end of the stroke, the hollow punches come into operation,

Fig. 9. At this set-up on a Pitchmaster thread-rolling machine, rotor-shafts are serrated by a knurling technique. A serrated component is delivered every 7 sec.

and each shears the feeder and flash from the edge of the corresponding rotor end-ring, against the top of the lamination stack. With this equipment, the rotors are die cast and fettled by the one operator, at the rate of 50 an hour.

The methods employed for producing the rotor-shafts differ according to the design of the motor and the quantities involved. Shafts for universal motors, required in large quantities, are machined on Acme-Gridley 6-spindle bar automatics, whereas shafts required in smaller quantities—including those for the industrial motors—are produced mainly on capstan lathes. The stage at which grinding of the various shaft-diameters is carried out—either before or after the assembly of the rotor-stacks—also varies according to the design of the motor. Mark II shafts are ground after the assembly of the rotor-stacks, as will be described later.

Fig. 10. On this Scrivener 2G machine, with automatic feed attachment, shafts are ground on seven diameters simultaneously. A ground shaft is delivered every 18 sec.

The serrations for retaining the laminations on the shafts are produced by a knurling technique, on Pitchmaster thread-rolling machines (Drummond-Asquith, Ltd.) and a typical set-up on one of these machines, for universal motor shafts, is shown in Fig. 9. A magazine feed attachment is provided, which incorporates an air-operated pusher. On this type of machine, the head that carries the left-hand roll remains stationary, whereas the head at the right is advanced by a cam, for the rolling operation. The motions of the pusher are synchronized with those of the machine by another cam, mounted on the same shaft as the roll-head cam. This second cam actuates an air valve which controls the pusher.

At the beginning of the cycle, the right-hand roll is in the retracted position. The pusher feeds a shaft from the bottom of the magazine on to the work rest, and remains in the forward position for a brief dwell period. During this dwell, the right-hand roll is advanced towards the work, and as soon as the component is lightly gripped between the revolving rolls, the pusher is withdrawn. Thereupon, the next component in the magazine drops into position, in line with the pusher, in readiness for the next stroke. Meanwhile, the work is knurled, the right-hand head is withdrawn, and the knurled shaft is then ejected into a chute by the advance of the next component. At this set-up, a serrated component is delivered every 7 sec. Shafts for Mark II motors are serrated on a smaller Pitchmaster machine, which is operated and loaded manually.

CENTRELESS GRINDING

A typical set-up on a Scrivener type 2G centreless grinder, for plunge grinding universal motor shafts on seven diameters simultaneously, in readiness for the assembly of the armature-stacks, is shown in Fig. 10. The various portions ground comprise the armature diameter, two bearing diameters, the commutator sleeve diameter, one threading diameter, and a lead to facilitate the assembly of the laminations. Limits of ±0·0001 in. are maintained on the bearing diameters, and the remainder are held within ±0·0002 in. For this purpose, profiled wheels are employed. The Norton grade A60-L5-VG main wheel, which is of 20 in. diameter, with a face-width of 7 in., is run at 1,140 r.p.m., and the grade A80 RR control wheel, of 12 in. diameter by 6¾ in. face width, at 11·6 r.p.m.

On this machine, also, an air-operated pusher-type magazine feed attachment is employed. At the bottom of the magazine, there is a pair of detent claws *S*, which are raised and lowered pneumatically, under the control of a cam *T*, on

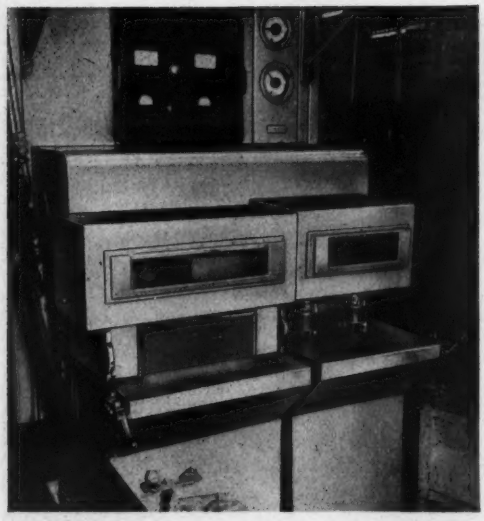


Fig. 11. The 2-head high-frequency induction equipment, here shown, is employed for heating the rotor-stacks, in preparation for pressing-in the shafts

ASSEMBLING THE ROTOR-STACKS

Mark II rotor-stacks are shrunk on to the shafts, and for this purpose, they are heated in the A.H.F. high-frequency induction equipment which is shown in Fig. 11. This heating, it may be noted, also serves as a stress-relief treatment for the die cast aluminium squirrel-cage bars. As may be observed, two heads are provided, and each incorporates two inductor coils. This arrangement affords a useful degree of adaptability to meet varying production demands, since each head can be operated independently. Thus, the two heads can be set up for heating different or similar components, and one can be loaded and unloaded while the other is in operation. Similarly, one head may be kept in use, while the inductor coils of the other are being changed. In Fig. 11, the equipment is seen set-up for single-head working, by one operator, who also presses-in the shafts.

The guard on each head is raised and lowered by means of a lever-operated air-valve. With the guard in the raised position, a rotor-stack is placed over each of two apertures in the table, as seen at the right, and the guard is then lowered. When another valve lever is operated, each rotor-stack is raised into the corresponding inductor coil by an air cylinder. This action also initiates the

the pusher slide, which operates in conjunction with the switches *U*. Towards the end of the forward stroke of the pusher, during which a fresh component is fed on to the work-rest, the claws are raised. A component is thereby released from the bottom of the magazine, and takes up a position against the side of the pusher.

Meanwhile, the preceding shaft is ground, and during the return stroke of the pusher, the claws S are lowered. It is thus ensured that, when the pusher is fully retracted, only the one component, previously released, drops on to the work-guide, as at *V*, the remainder being retained in the magazine by the claws S. By this time, the preceding component has been ground, and the wheel-head has been withdrawn. At the next forward stroke of the pusher, the fresh component is fed on to the work-rest, and the ground component is ejected into a chute. At this set-up, a ground component is delivered from the machine every 18 sec.

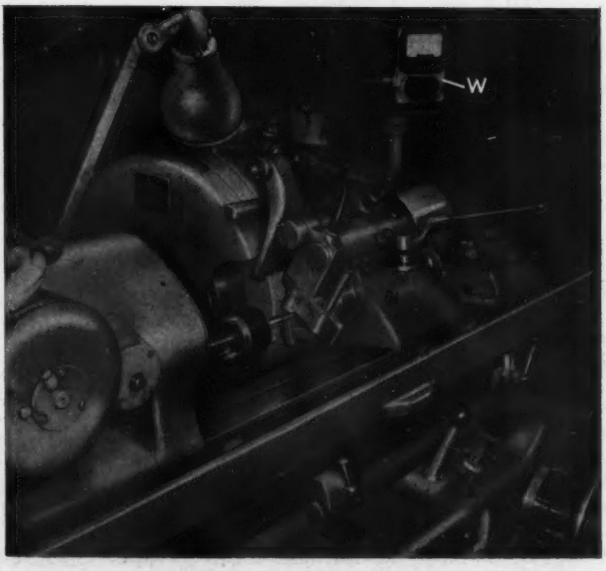


Fig. 12. Lund Precimax cylindrical grinding machines, fitted with Stop-Cote automatic size-control equipment, are employed for grinding Mark II and IV rotor-shafts

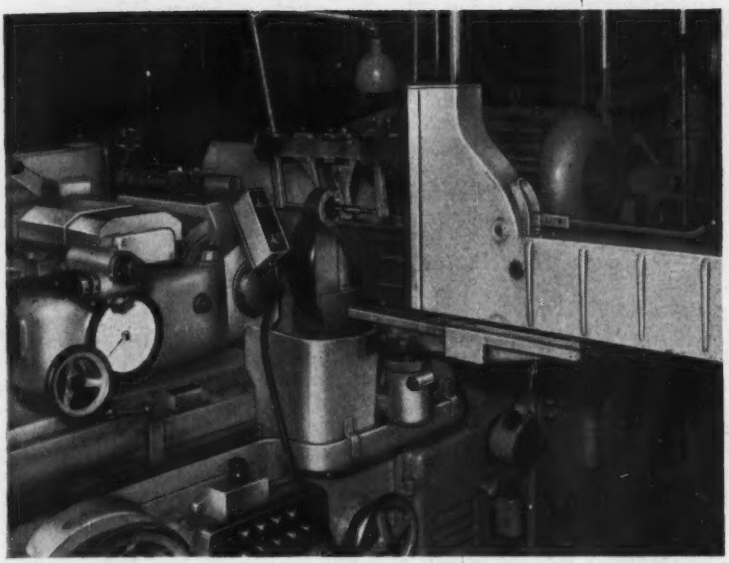


Fig. 13. This Lidköping type 4 BU centreless grinder, adapted for plunge grinding, is employed for grinding rotor-shafts for type A.C. 14 washing machine motors

automatic heating cycle, which is controlled by an adjustable process-timer. For the Mark II rotors, the heating cycle is of 45 sec. duration.

When the heating current is switched on, a red signal-lamp is lit, and remains illuminated until the current is cut off. Thereupon, the rams are lowered, the guard is raised, and the heated components are transferred to a 12-ton Hi-Ton hydraulic press, on which the shafts are pressed-in. With one operator, and single-head working, the shafts are assembled to two rotors while the next two are being heated, and the combined cycle-time for both operations is 50 sec. per two rotors.

As already indicated, the various diameters of the Mark II rotor shafts are ground after the assembly of the armature-stacks, and the procedure for Mark IV rotors is similar. The grinding of both types of shaft is performed on Lund Precimax cylindrical machines, which are fitted with Stop-Cote automatic sizing equipment (Electronic Gauges, Ltd.). One machine is used for grinding one bearing diameter and the shaft extension, simultaneously, with a stepped wheel, and a second machine for grinding the other bearing diameter, with a plain wheel. A typical set-up on one of these machines is shown in Fig. 12, where the Stop-Cote gauging head and the associated dial instrument W may be seen. This instrument, which has an overall scale-range of 0·002 in., can be read directly to 0·0001 in., and is used mainly for setting and calibration.

To facilitate loading, the gauging head is swung upwards, clear of the working area. Once the

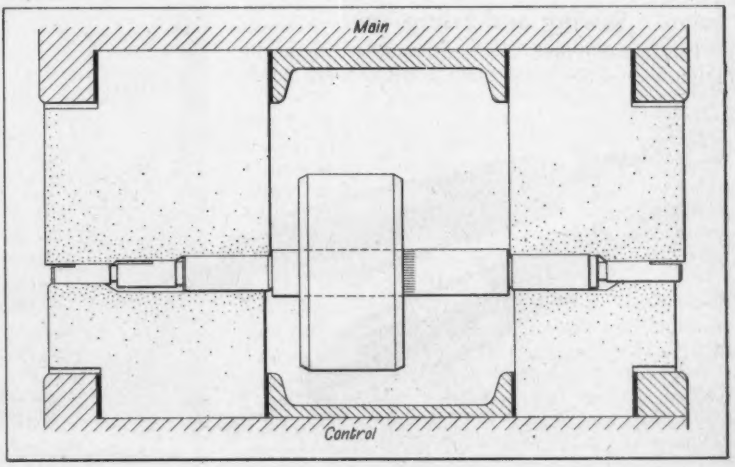


Fig. 14. Plan view showing the arrangement of profiled wheels on the Lidköping machine

work has been set-up between centres, the head is returned to the working position, with the carbide-faced gauging contacts in engagement with the bearing diameter to be ground. When the automatic cycle is started, the wheel-head is advanced to the work, and thereafter the gauging equipment controls the grinding operation, including the point at which in-feed is stopped, and the duration of the sizing dwell. As soon as the required size has been reached, the wheel-head is withdrawn. On the machine used for bearing-diameters only, a Carborundum grade M5 BA80 VBLU wheel, of 18 in. diameter and 2 in. face-width, is employed, and is run at 1,050 r.p.m. On the other machine, the grade L5 BA463 VFBLU wheel, of 20 in. diameter by 4 in. face-width, is run at the same speed. At each set-up, a total of approximately 0·015 in. on diameter is removed, in a cycle-time of 6 sec.

For the corresponding operations on the rotor assemblies for the type A.C.14 washing-machine motors, the company has installed the Lidköping No. 4 BU (Drummond-Asquith, Ltd.) centreless grinder shown in Fig. 13, which has been adapted for plunge grinding, in accordance with a Hoover specification. At present, a manually-operated loading and unloading device is employed (as seen in Fig. 13), but it will subsequently be replaced by an automatic power-operated attachment. The main head is advanced to apply feed.

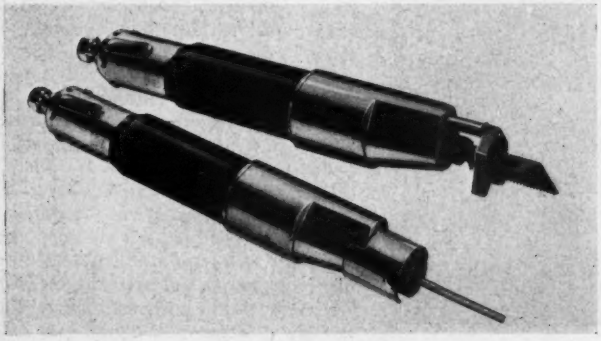
Five surfaces are ground simultaneously, with profiled wheels, as shown diagrammatically in Fig. 14. These surfaces comprise the two bearing diameters, and the single and double shaft extension diameters, at the right and left, respectively. The bearing diameters are maintained within ±0·00015 in., with a surface-finish of 20 micro-in. r.m.s., and the remaining diameters, within ±0·00025 in. For this operation, Norton grade A60 L5 VG main wheels, of 20 in. diameter, are employed, and are run at 1,700 r.p.m. One wheel has a face-width of 4·17 in. and the other, of 3·3 in. The grade A80 R 1B control wheels are of 12 in. diameter, with face-widths of 4·02 in. and 3 in., and are run at 492 ft. per min.

The machine is provided with a feed-cam designed to give a long sizing dwell, and is arranged for an output of 95 pieces an hour with fully-automatic operation. At present, however, pending the installation of the automatic loader, it is set to stop automatically after each cycle. With the manual loading system, the output is 75 assemblies an hour. The total metal removal on each of the diameters is 0·010 in., and redressing is necessary after grinding 250 to 300 pieces. The dressing attachment is hydraulically operated, and is controlled by a profile bar. First industrial-quality dressing diamonds (Van Moppes, 1·5 to 2 carat) are employed. With the Swedish control-wheels (A/B. Slipmaterial-Naxos, Coralon grade 9SN 193) 6,000 to 8,000 components can be obtained per dressing.

Some further examples of the methods employed will be considered in a later article.

"Consolidated Pneumatic" Portable Sawing and Filing Tool

The portable tool here illustrated, which can be fitted with either a saw blade collet or a file chuck, has been introduced by the Consolidated Pneumatic Tool Co., Ltd., 232 Dawes Road, London, S.W.6. Known as the type CP 3017F, it incorporates a Power Vane air motor, the conversion from rotary to reciprocating motion being obtained by means of a cam follower arrangement. The speed of operation is 1,500 strokes per min. and the stroke length is ¾ in.



Consolidated Pneumatic type CP 3017 F air tools equipped for sawing and filing

A throttle, of the graduated poppet valve type, with neoprene seating, provides for controlled starting, and there is a built-in speed regulator. Lubricant is supplied to the motor from a reservoir incorporated in the handle. To keep the work clear of cuttings, exhaust air from the motor is directed downwards through the nose of the tool.

With an overall length of 14½ in. the tool weighs 5 lb. Standard equipment includes a saw collet and a file chuck and guard.

Use of Wax for Holding Honeycomb for Machining

AT THE WORKS of Temco Electronics & Missiles Co., U.S.A., a variety of components is being produced for aircraft and missiles, in which considerable quantities of honeycomb material are used. One contract, for example, for wings and elevons for the Raytheon Hawk missile, calls for honeycomb sandwich structures almost exclusively. This work is being carried out in the company's Grand Prairie plant at the western edge of Dallas, Texas.

For machining honeycomb core material in quantity it is necessary to employ a method of holding which is economical, effective, and suitable for line production. The process adopted involves the use of shaped platens and wax, and has proved reliable.

Fig. 1. Water-soluble wax is here being ladled into the preheated platen. The wax has a melting temperature of 145 deg. F.

Fig. 2. While the wax is still liquid, bags of shot are distributed over the core to ensure that the lower surface is held in contact with the platen

Platens are cut from ½-in. thick aluminium plate approximately to the edge profile of the core section. Six of these platens are needed to accommodate the various sections that make up the Hawk wing, and five more are used for the elevon sections of this missile. Aluminium strips, ⅜ in. thick, are machined where necessary and then screwed and dowelled to the platen to serve two main purposes. Firstly, they accurately locate the honeycomb core with respect to the platen, and secondly, they serve to contain the warm liquid wax until it has solidified.

The platens are first placed in an oven and heated to a temperature of 150 to 250 deg. F. They are then brought to a heating pot seen in Fig. 1, and then melted wax is ladled into the cavities. Carbowax 6000 is used for this purpose. It is a water-soluble wax which melts at 145 deg. F. and solidifies at 110 deg. F.

While a platen is still adjacent to the melting pot, the honeycomb core is carefully positioned on it and pushed down into the liquid wax. The core is a snug fit within the retaining strips and is thus positively located. To ensure contact between the bottom of the work and the surface of the platen while the wax hardens, the assembly is placed on a table where bags of lead shot are laid on top of the core, as shown in Fig. 2.

Solidification of the wax is accelerated by subjecting it to a reduced temperature. The platen is transferred to a roller table and pushed into a refrigeration unit. Here it is allowed to cool for 30 min. Actually, the temperature of the platen is not lowered drastically. All that is necessary is that it be brought down quickly to 100 deg. F., which is well below the point at which the wax hardens.

Fig. 4. An 18-in. diameter disc cutter driven by a head mounted on the cross-rail of the planer finishes the core surfaces to size

MOUNTED CORES ARE ROUGH AND FINISHED MACHINED AT THE SAME SET-UP

For cutting the honeycomb, a planer which has been in service for many years has been adapted. An Onsrud milling head is mounted on the cross-rail and drives an 18-in. diameter disc-type cutter. In addition, a band saw has been mounted behind the cross-rail between the two upright columns, and the planer has been fitted with General Electric equipment which provides for machining under the control of a template.

Platens containing the honeycomb cores to be cut are lined up in two rows along the planer table. Bases support the platens at various angles to ensure that the cores are machined to the required forms.

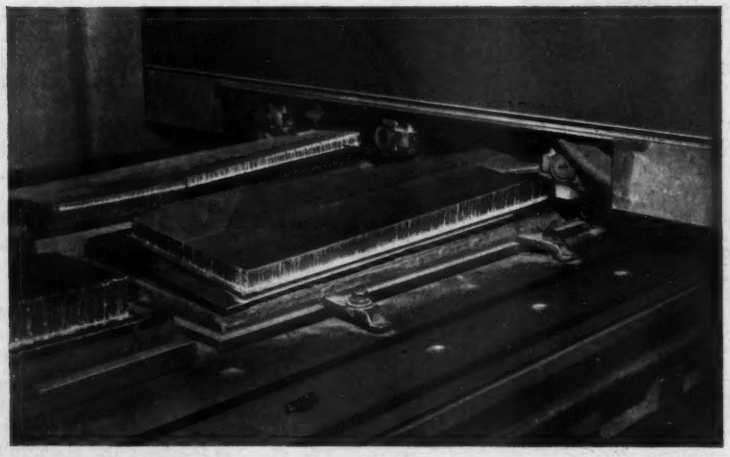


Fig. 3. Platens are set at an angle for contouring cuts on a converted planer. The honeycomb first comes in contact with a band-saw blade which roughs it to within 0·030 in. of size

As the table carries the platens towards the columns, the core material is first fed against the band-saw blade, as seen in Fig. 3. At this rough-cutting operation the surface of the honeycomb is brought to within 0·030 in. of the specified size. Continuing past the columns, the work is engaged by the disc cutter, and the top surface is trimmed to final dimensions. The 18-in. diameter disc, seen in Fig. 4, cuts only two-thirds the width of one line of cores at a single pass, whereas the band saw, which extends

across the full width of the table, roughs both lines. Two additional passes are therefore necessary to finish the surfaces of both lines of cores.

HONEYCOMB REMOUNTED TO WORK OPPOSITE SURFACE

Depending on the angle at which the core is presented to the band saw and disc cutter, only one section of the surface of each core is roughed and finished at one setting. The number of individual surface sections at different angles determines how many times work must be repositioned on the machine table, to complete one side. It will be understood that for all the operations on a side, the core remains undisturbed in position in the original platen.

To enable cuts to be taken subsequently on the opposite side of the work, the core must be remounted to expose the flat face. For this purpose, the platen and the core are placed in the same oven as was previously used for preheating, where they remain for a period of 35 to 40 min. at a temperature of 200 deg. F. During this time the wax melts, and when the platen has been removed from the oven the operator picks up the core with asbestos gloves, and places it on a mesh grid. An air hose is then used to blow off excess wax.

Both honeycomb and platen are next placed in a wire basket and submerged in a tank containing hot water and detergent at a temperature of 175 deg. F. This treatment suffices to clean the platens sufficiently to prepare them for re-use.

The honeycomb is now mounted in a second-operation platen with a surface which is contoured to suit the form of the core surface that has already been machined. For machining the opposite side of the core, the procedure described above is repeated, and the finished core is finally subjected to an additional prebonding cleaning treatment.

Although this method of holding cores for machining has proved satisfactory, other possibilities are being investigated which, it is hoped, will give even better results.

Cabinet Installation for Dust-free Motor Assembly

Special assembly cabinets, designed and constructed by Plannair, Ltd., are here seen installed in the new Acton factory of Vactric (Control Equipment), Ltd., 207 Sloane Street, London, S.W.1. Air is drawn through two filters at the back of each cabinet, where it is heated and then forced into the assembly area by a 5-in. blower.

The cabinets are being used for the selection and assembly of motor housings, stators and rear-end frames for miniature servo motors. In each cabinet, the assembly area is enclosed by a transparent roof, free from any obstruction, and a transparent door. When the latter is opened, a light is switched on, and the operator can insert his or her hands, one on each side of a narrow Perspex flap. With this simple arrangement it is ensured that both hands cannot be withdrawn to perform an operation outside the clean-air area.

Provision is made for adjusting the height of the assembly area to suit the convenience of the operator, and each cabinet stand is provided with an adjustable footrest.

An installation of Plannair dust-free assembly cabinets in the works of Vactric (Control Equipment), Ltd.

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Painting and Assembling Domestic Lawn Mowers

Some Examples of the Equipment and Procedures Employed by Ransomes Sims & Jefferies, Ltd., Ipswich

By A. W. ASTROP, Associate Editor

PREVIOUS ARTICLES IN MACHINERY* have described the production of components for domestic lawn mowers at the Ipswich works of Ransomes Sims & Jefferies, Ltd., with particular reference to the Sprite and Conquest machines. Mention has been made, for example, of the production of medium- and heavy-gauge steel pressings, several of which are incorporated in each type of machine, automatic induction brazing equipment for joining sub-assemblies, the bending and twisting of cutter blades and their assembly to cylinders, and the use of metal patterns for moulding land wheels, driving gears, and pawl boxes. In this fourth—and final—article, some details are given of the pre-treatment and spray painting installation for finishing the various components and sub-assemblies, also of the flow-line methods for assembling, adjusting, and running-in Sprite and Conquest machines. A general view of this flow-line is shown in the heading illustration, and it may be noted that a fully-assembled, adjusted, and run-in Sprite machine is delivered to the packaging section every 4 min., and a Conquest machine every 1¼ min.

SPRAY-PAINTING AND ASSOCIATED EQUIPMENT

As the various component parts and sub-assemblies are completed they are brought to the starting point of a continuously-moving, overhead conveyor system, whereby they are transported through a large fully-automatic preparation installation, thence to the spray-painting booth, and finally, to the assembly line. Throughout this journey, the components are suspended from hooks incorporated in frame-type hangers of a variety of designs, and one of these hangers can be seen at the extreme left in Fig. 1. This view shows the entry end of the pre-painting section, which comprises a series of interconnected booths. In the following order, the hangers, with their loads of components, are passed through: a Teepol wash; a weak Bonderite treatment (hot); a strong Bonderite treatment (hot); a cold water rinse; a chromic acid treatment (hot); and finally, a hot-air drying section. These various treatments are applied successively, in booths of the type seen in Fig. 1, and as the hangers emerge from the far end the components are ready for the application of paint.

The spray-painting booth is arranged adjacent to, and parallel with, the pre-treatment section, and is located at the left-hand side as viewed in Fig. 1. From the exit end of the drying booth, the conveyor turns through 180 deg., so that the hangers move down the left-hand side of the pre-treatment booths. A second 180-deg. turn brings them to the entry of the spray-painting section, a general view of which is given in Fig. 2. Four colours are employed and there are four operators, two at each side. Behind each operator there is a spray-gun rack, and when a change of colour is required, he merely replaces the previous gun and selects another.

As far as possible, components requiring one colour are passed through in medium-size batches, so that reasonable runs are ensured. Warning that a batch of components requiring a different colour

* 98/60—11/1/61; 98/189—25/1/61; and 98/303—8/2/61.

is approaching is given by the simple expedient of leaving two hanger frames empty. One of these frames carries a small sheet metal plate painted with the colour next required, so that the operator has ample time to change guns. Paint is pumped to the booth from four bulk storage tanks which are installed in a nearby paint store.

From the spray booth, the conveyor passes through a drying oven, the exit end of which is adjacent to the start of the assembly line. The various parts, on which the paint is now stoved and hardened, are removed from the hangers at the far end of the line seen in the heading illustration, and are stored in large open-topped bins, to be withdrawn as required. It may be noted that the overhead conveyor system was designed and constructed by the company, and that the pre-treatment installation was supplied by Stordy Engineering, Ltd., Wolverhampton.

The slat-type conveyor band seen in the heading illustration is of the slow, continuously-moving type, and serves for the assembly of a range of hand and light motor mowers, also the Sprite and the Conquest machines. The latter are assembled at stations on the right of the band, as viewed in the illustration, and Sprite machines at stations on the left.

Fig. 2. The entry end of the spray-painting booth. Four colours are employed, the guns being held in a rack behind each operator

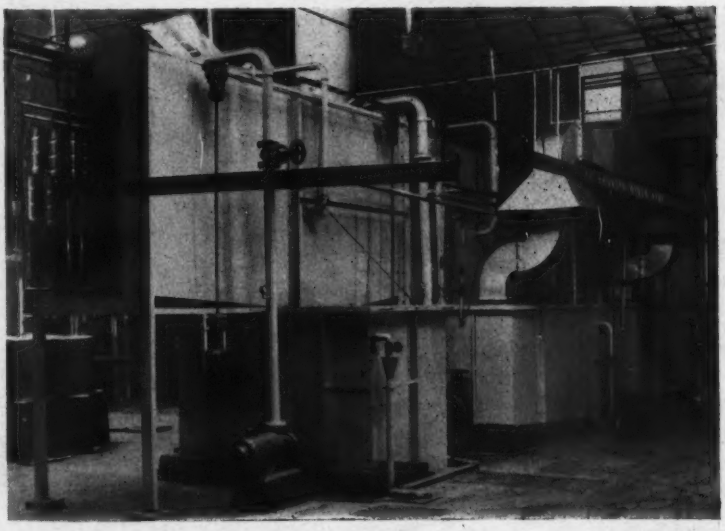


Fig. 1. General view of part of the Stordy pre-treatment plant in which lawn mower components are prepared for spray-painting

The two types of mowers are mixed indiscriminately on the band, although as a result of the difference in assembly times there is always a greater number of Conquest than of Sprite machines in progress. At the delivery end of the band, in the foreground in the figure, Conquest machines are pulled off to the right, on to a free-running roller-type conveyor, where they are loaded into cartons, and sealed with 3-in. wide paper strip. Sprite machines are similarly handled, at a packing station on the left-hand side of the band.

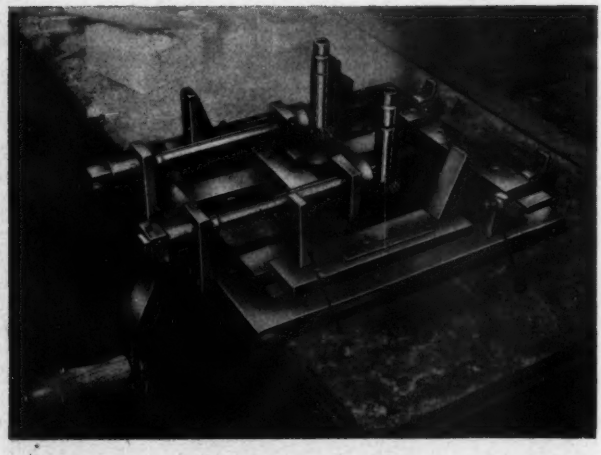


Fig. 3. This swivelling fixture holds the two main sub-assemblies of the Conquest machine while the deep-drawn cover is fitted

At the various stations on both sides of the band, assembly fixtures and mechanical aids are provided, and in Fig. 3 is seen the fixture which holds the two main sub-assemblies of the Conquest mower while the deep-drawn cover is secured in position. It may be recalled that this cover is the main structural member of the machine, and serves to hold the land-wheel and cutting cylinder sub-assemblies in the correct relationship, also to take the thrust of the chain drive. The fixture seen in Fig. 3 is swivel-mounted on the bench, and can readily be turned through 360 deg. to suit the convenience of the fitter.

Various locating blocks and stops are provided, also two vertical shafts *A*, on the upper ends of which there are standard nut sockets. Each shaft is arranged to turn freely in a bearing in the base of the fixture, and can be rotated through bevel gearing from a horizontal shaft which extends to the front. The crank handle seen in the left foreground can be applied to either shaft.

Fig. 4 shows the same fixture, turned through 180 deg., with the two sub-assemblies of a Conquest machine in position. The land-wheels, which are joined by a pressed-steel axle bracket, are assembled at preceding stations on the line, as are the cutting cylinder, bottom blade, associated end brackets and bearings, and the wooden roller. Blocks, as at *B* in Fig. 3, serve to locate the complete cutting cylinder assembly, and the land-wheel assembly is positioned between the two pairs of chocks, as at *C*. Before the two sub-assemblies are loaded into the fixture, a standard nut is dropped into each of the sockets on the shafts *A*.

Referring to Fig. 4, it will be seen that these sockets are immediately below two holes in the axle bracket for the land-wheels. The pressed-steel cover, seen at the left in Fig. 4, is placed over the two sub-assemblies, and two bolts are passed through the holes *D*, so that the ends engage with the nuts previously loaded into the two sockets. The complete fixture is then turned through 180 deg., to bring the square-ended shafts to the front, and the crank handle is applied to each in turn. A number of additional securing screws is then inserted, for example, in the holes *E* and *F*. It may be noted that self-tapping screws are employed in these positions,

Fig. 4. The two main sub-assemblies for the Conquest mower are here seen in position in the fixture, and the deep-drawn steel cover is at the left

Fig. 5. This fixture holds the Conquest machine while final adjustment of the bottom blade is carried out

Fig. 6. The cutting cylinder and bottom blade are run-in, with lapping compound, on this special power-driven unit

and are tightened by means of the Atlas Copco air driver seen in the right foreground, which is fitted with a Philips cruciform-type bit.

When the cutting cylinder and bottom blade sub-assembly is completed, at an earlier station, these two items are adjusted initially, but they are finally set after the assembly stage just described. For this operation, the machine is held in a simple fabricated fixture, as seen in Fig. 5. The bottom blade is set, by means of the adjusting screws provided, with the aid of the socket spanner seen in the operator's left-hand. At this station, a roll of 1-in. wide paper tape, of known thickness, is provided, and the bottom blade is so adjusted that when the cutting cylinder is rotated (by hand) and the leading end of the tape is inserted at any position along the full width, a clean cut is made.

At the final operation, the cutting cylinder is lapped-in to the bottom blade, by means of the equipment shown in Fig. 6. Here, the machine is placed on top of a cabinet, and a motor-driven roller engages with the land-wheels. The wooden roller is located in a pair of V-blocks, and a lever-operated weight is applied to force the land-wheels into contact with the driving roller. On the underside of this weight, which is indicated at *G*, there are two forked members, which engage the heads of the bolts inserted in the holes *E*, Fig. 4. Lapping compound is applied to the cutting cylinder by means of a wide brush, as seen in Fig. 6, and the

Fig. 7. The various sub-assemblies for a Sprite motor mower are here seen placed in position in the main assembly fixture

machine is driven for approximately 2 min. The paper-cutting test is also repeated here.

For assembling the Sprite motor mower, the procedures are generally similar, and suitable equipment is again provided for lapping-in the cutting cylinder to the bottom blade. The main assembly fixture is shown in Fig. 7, with the three main sub-assemblies in position. Of the swivelling type, the fixture can be turned through 360 deg., to suit the convenience of the fitter, and provision is also made for tilting. When the cover at the left has been placed in position, the complete assembly is raised, by the wooden roller, and pivots about the centre of the land roller. In this position, the sliding latch *H* is moved to the right, so that it projects beneath the raised machine to support it while the cutting cylinder is finally secured in position.

Further down the line, the 34-cc. JAP engine and its attachment bracket are fitted, and the bottom-blade adjustment and running-in operations are carried out. Towards the end of the line, transfers are applied, to both types of machine, and a drying unit is suspended above this station to accelerate the hardening process. Each machine is inspected closely, for finish, and those which require touching up or any further adjustment are removed from the conveyor and passed to a special section where such faults are rectified.

The JAP engines for the Sprite machines are delivered direct to the assembly line, and are unpacked as required. A random inspection procedure provides for the removal of a fully-assembled Sprite machine from the line at frequent, but irregular, intervals, for test under power.

Small Batches of Parts Produced Automatically with Tape Control

AMPLE EVIDENCE IS NOW AVAILABLE of the practical advantages of numerical control for much of the work undertaken in medium- and small-sized shops. For example, the Mechanical Specialties Co., Los Angeles, Calif., U.S.A., employs tape-controlled equipment for performing various machining operations. One of the principal tape-controlled machine tools in this plant is the Burgmaster turret drilling machine which is illustrated in Fig. 1.

Fig. 1. Burgmaster tape-controlled turret-type drilling machine on which small batches of parts are handled efficiently

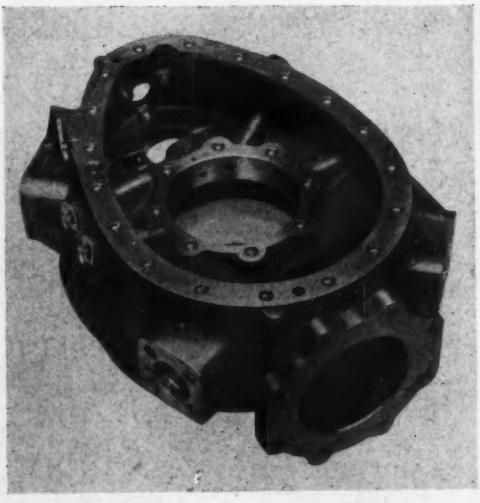


Fig. 2. Only two set-ups are required to centre-drill, drill, counterbore, chamfer, and tap—as necessary —28 holes in this top section for the inlet of a hydraulic control valve. The machining time is 1·2 hours

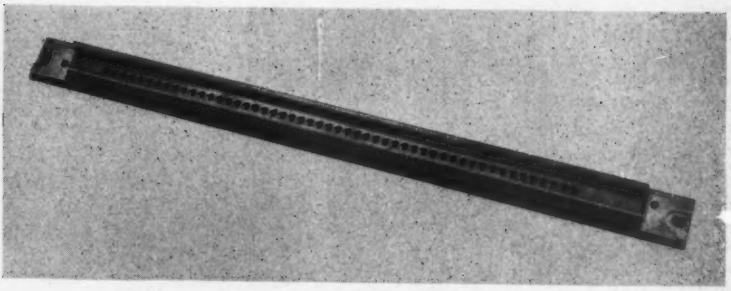


Fig. 3. Fifty holes, each involving five operations, are required in this steel computer rail. The use of a tape-controlled machine and relatively simple equipment avoided the need for an expensive indexing fixture

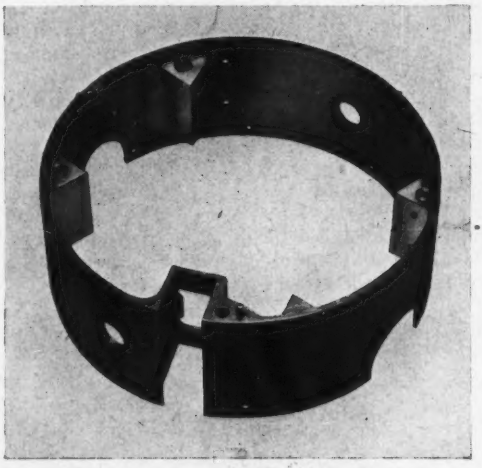


Fig. 4. A typical short-run missile component, this bronze ring has 9 holes which require up to five operations each

Among a wide variety of parts which are produced in small batches on this machine are many precision missile components. A typical workpiece is the computer rail shown in Fig. 3. This part has 50 accurate holes and formerly required the use of an expensive indexing fixture. The holes are now centre drilled, drilled, counterbored, chamfered, and bored on the turret drilling machine at the rate of 1·7 hours per part, and the equipment was produced in 8 man-hours.

For this and similar short-run applications the savings in tooling costs are of great importance. The automatic positioning of the tape controlled table makes it unnecessary to provide complex jigs and fixtures. Simple work-holding arrangements and standard clamping devices usually suffice. In addition, production can be started with little delay since the tapes are quickly prepared.

The operator receives the tape and a programme sheet which lists the turret tooling and gives the necessary information for making machine adjustments. Once the automatic cycle has been started, all machine functions are controlled by the tape. The table positions the work under the turret within ±0·001 in. for each operation stage, the turret is indexed through a predetermined sequence, and for each position, the correct speed and feed and depth setting is engaged.

Other work performed on the machine includes the centre drilling, drilling, and tapping of 140 holes in the cast-aluminium gimbal seen in Fig. 5, which forms part of a missile guidance system.

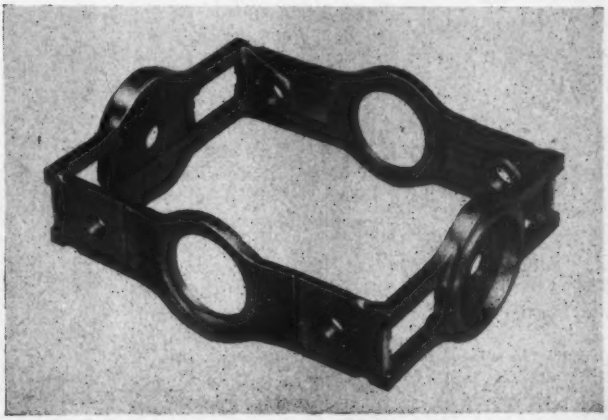


Fig. 5. Cast-aluminium gimbal for a missile guidance system in which 140 holes are centre-drilled, drilled, and tapped under tape control at six simple set-ups

Although six separate set-ups are involved, only simple tooling is required, and the machining time for each part is 2·3 hours.

At two set-ups, 28 holes are machined in the top (Fig. 2) and bottom of sections of a cast-steel inlet for a hydraulic control valve. The holes are centre-drilled, drilled, counterbored, chamfered, and tapped in 1·2 hours. Nine holes are machined in the bronze ring shown in Fig. 4. This component—for a missile—is centre-drilled, spot-faced, drilled, tapped, and bored in a single set-up in 42 min. The tooling required was produced in only 4 man-hours. A study of six typical short-run jobs showed that the average saving in tooling per job was 540 dollars.

British Clearing Torc-Pac Presses

Reference was made in MACHINERY, 96/1613—29/6/60, to the British Clearing range of Torc-Pac O.B.I. open-back inclinable presses. Machines in this range with capacities of 22, 32 and 45 tons are now being built by Vickers-Armstrongs (Engineers), Ltd., Crayford, Kent. The sole selling agents in the United Kingdom for these machines, the largest of which is shown in the accompanying illustration, are Rockwell Machine Tool Co., Ltd., Welsh Harp, Edgware Road, London, N.W.2.

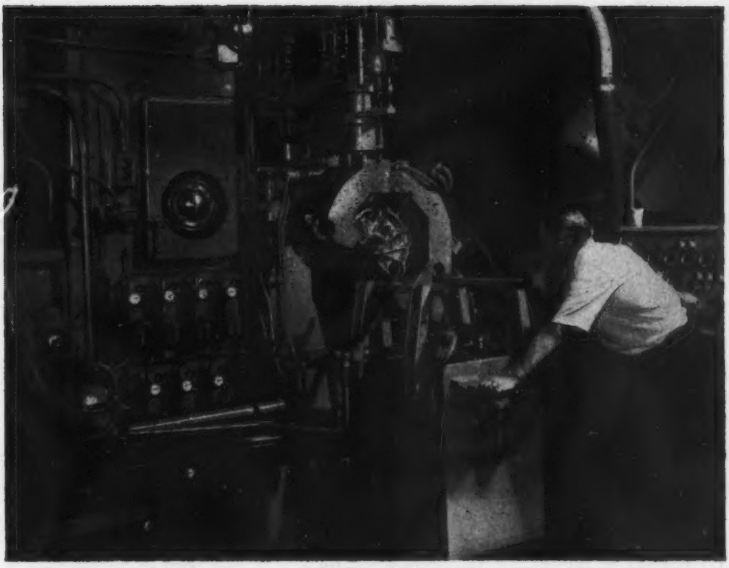
The fabricated frame may be tilted from the vertical position through an angle of 30 deg. on the smaller machines, and 25 deg. on the 45-ton size. It may also be noted that the throat depth on the larger presses is normally 8 and 9½ in., but may be increased to 10½ and 12 in. If required, the frame can be modified, to incorporate variations from the standard specification. A press can be supplied with one of four stroke lengths, the maximum available being 4, 5 or 6 in, depending upon the capacity. The maximum working speeds for the smallest and intermediate machines are 225 and 150 strokes per min., and the single speed for the largest size may be 75, 90 or 122 strokes per min.

A motor of 2, 3, or 5 h.p., according to the size of the press, is provided for the Torc-Pac unit, and drive is taken through a V-belt to a flywheel. The shaft for this flywheel runs in anti-friction bearings at the upper end of a housing which encloses a clutch and a brake. These members are mounted co-axially, run in oil, and are of the multi-disc type, the friction discs being of sintered bronze and subject to little wear. Disengagement of the brake and engagement of the clutch are effected simultaneously by an air cylinder, and when the air pressure is released, the clutch is disengaged and the brake applied by means of springs. In this way, the alternate operation of the clutch and brake is ensured, and the press is stopped automatically in the event of failure of the air supply. From the lower end of the clutch shaft, drive is transmitted through oil-immersed reduction gearing. The entire drive unit is sealed, and a replacement unit, which is available from stock, can be fitted in less than one hour.

The laterally-mounted ground eccentric runs in anti-friction bearings, and an extension through the front of the frame, which may be employed for driving such equipment as a strip feed, also provides for the operation of a limit switch, for stopping the ram in the uppermost position. This switch is actuated through a cam, which may be adjusted to compensate for changes in the working speed. The ram is mounted in V-ways, and has one adjustable gib strip.

There is a 4-position selector switch, which may be set for continuous or single-cycle operation, inching, or "off." With an alternative switch that can be fitted there is an additional position, in which the press is caused to run until the ram reaches the top of the stroke. "Start" and "stop" push-buttons are provided at the front of the bed. The electrical control equipment is housed in a cabinet attached to one side of the frame.

CleBritish aring Torc-Pac O.B.I. 45-ton,open-back, inclinable press



Some Examples of Machining Operations and Tools Employed on Aluminium Cylinder Blocks

THE INTRODUCTION of the V-8, 215-cu. in. displacement engine, known as the 4,100, for 1961 Buick cars, has resulted in numerous departures from practices which have long been established in connection with the machining of cast-iron engine components.

The crankcase and block of the new engine, which is shown in Fig. 1, are of aluminium, and are produced, with the iron cylinder liners cast in position, in the General Motors foundry at Alliance, Ohio, U.S.A. A combination mould—part sand and part permanent—is used, and the water jacket is cored in the usual fashion.

Composition of the aluminium alloy is: silicon 6·5 to 7·5, copper 9·25 max., magnesium 0·20 to 0·40, iron 0·6, manganese 0·35 max., zinc 0·35 max., titanium 0·25 max., and all other elements 0·15 max. per cent.

The 4,100 engine delivers slightly more than 155 h.p. at 4,800 r.p.m. and has a total weight of 305 lb. By comparison it may be noted that the 1960 cast-iron engine of 225 h.p. weighed 575 lb. The aluminium crankcase and cylinder block weighs 62 lb. as compared with 194 lb. for cast iron, and the aluminium cylinder-head, 15 lb. as against 85 lb.

Wherever it proved practical and economical, manufacturing equipment formerly employed for operations on cast-iron engines was adapted for machining components for the 4,100 engine, and the same policy was followed in connection with other assemblies for the 1961 Buick Special car. It has been estimated that the cost of the crankcase and cylinder block line would have been 40 to 45 per cent greater if new machines had been provided throughout. Even with these economies, the expenditure on conversion and new equipment for producing the 4,100 engine amounted to 13·5 million dollars, of which the crankcase and cylinder block line accounted for approximately 6 million dollars. Of 14 major machining units incorporated in this line, only three are new.

One of the principal changes in machining practice that has resulted from the adoption of the

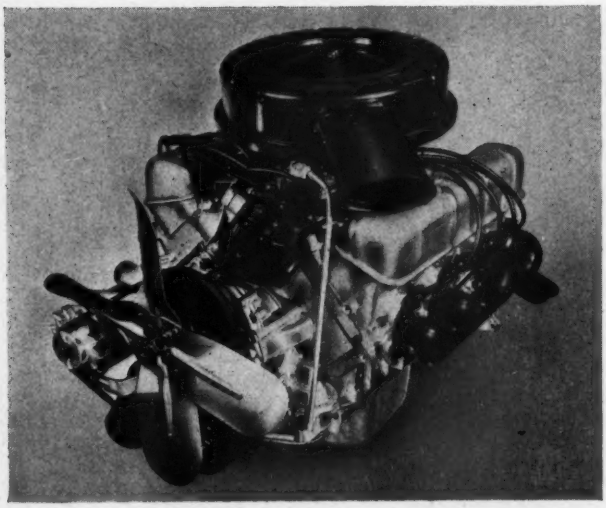


Fig. 1. The 4,100 engine for the 1961 Buick Special car has an aluminium cylinder block and crankcase with cast-in iron liners. Aluminium is also employed for the cylinder heads, intake manifold, sump, valve covers, and front end housing

aluminium cylinder block and crankcase has been the elimination of broaching, except for one operation. The aluminium block is milled on the sump face and starter mounting bosses at speeds of 1,500 to 2,000 ft. per min. When milling the cylinder head joint faces, on the transfer machine shown in Fig. 2, cuts are taken across areas where the cast-iron cylinder sleeves are flush with the aluminium surface, and the speed is therefore reduced to 1,200 ft. per min.

Broaching cannot be carried out on aluminium crankcase castings because the necessary clamping pressures and the cutting forces would distort or crush the castings. With high-speed face milling, however, the surfaces are machined nearly as rapidly as by broaching. For these operations, comparatively small clamping pressures suffice, and the aluminium castings have sufficient compressive strength to resist the cutting forces imposed.

Carbide-tipped milling cutters with special bodies are used throughout. For milling aluminium, the teeth are ground with 6- to 8-deg. positive front rake and side rake angles. Cutters used for combination cuts on cast iron and aluminium, for example, on the bank faces, have alternately ground teeth (one with angles to suit cast-iron, and the next, to suit aluminium). Teeth with zero rake are used for interrupted cuts. Hard grades of tungsten carbide are employed for the tips. All tooth surfaces that come in contact with aluminium chips are lapped with 500-mesh diamond abrasive to a profilometer reading of 4 to 6 micro-inches. Very smooth surfaces are necessary to prevent the chips from welding to the teeth, and only scratches extending across the face of a tooth can be tolerated.

The milling cutter bodies are specially designed to provide ample chip clearance, as indicated by the example at the extreme right in Fig. 3, and all areas with which chips may come in contact are free from cavities or projections, and are polished.

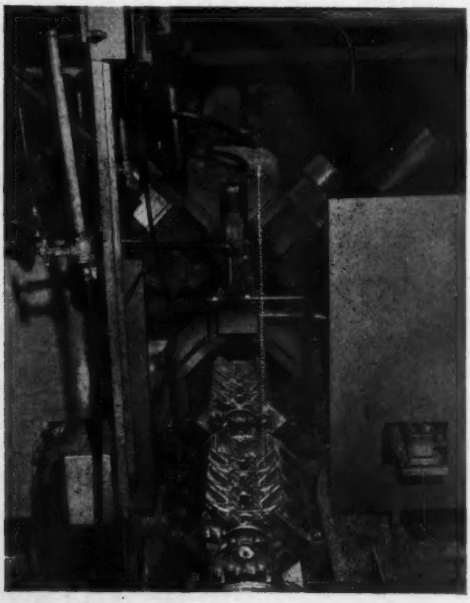


Fig. 2. Transfer machine on which the faces for the cylinder heads are milled. At this operation, combination cuts on the aluminium block and the cast iron liners are taken

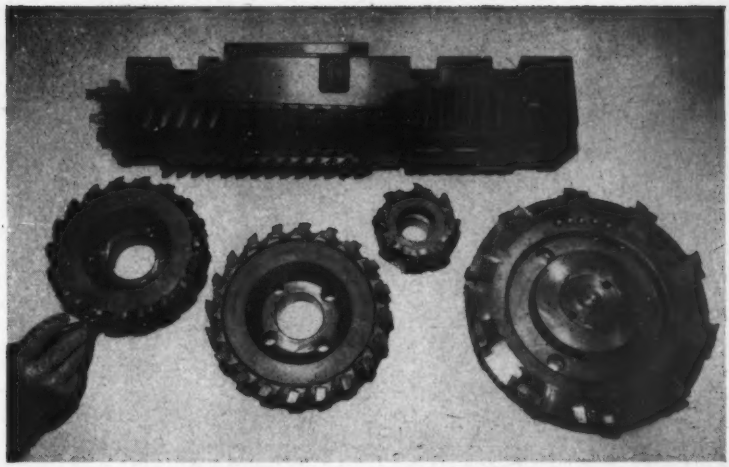


Fig. 3. Milling cutters employed on aluminium have positive rake and ample chip clearance. Bodies are of clean design, and polished to prevent adherence of chips. The broach at the top is the only tool of this type used on the aluminium block. It provides for finishing the faces and ends of the main bearing cap seats

Cutter speeds and tooth loading are so high that chips are discharged in a stream, in a plastic state. If a chip lodges in the cutter body, others rapidly become welded to it, and in a few seconds the mass which accumulates is sufficiently large to stop the machine spindle or break the cutter body.

The taps used for threading holes are of a special Turbo-Cut design by Threadwell Tap & Die Co., Greenfield, Mass., and have ground spiral flutes, as will be seen from the example at the extreme right in Fig. 4. The comparatively small helix angle has the same effect in tapping as an increase of rake on cutter blades. Highly polished flutes of unusual depth facilitate the discharge of chips.

At three different positions in the production line powerful tunnel-type washing installations have been provided. Here, the castings are blasted with 6 per cent Elray soluble-oil emulsion to remove adhering chips.

For drilling, especially of the two oil-gallery holes, special tools are employed. These two holes extend for the entire length of the casting. Gun drills were found to be insufficiently fast, and the life was comparatively short. To overcome these limitations a new tool known as a tube drill, which is made by Detroit Reamer & Tool Co., Birmingham, Mich., has been adopted. These 0·4375-in. diameter Bi-Tip drills were designed specially for deep holes in aluminium. As seen in Fig. 5, they have high-speed, replaceable 2-flute tips, drilled at the point for constant coolant delivery to the lips at 40 lb. per sq. in. After about one turn along the highly polished shank, one flute ends, and the tool

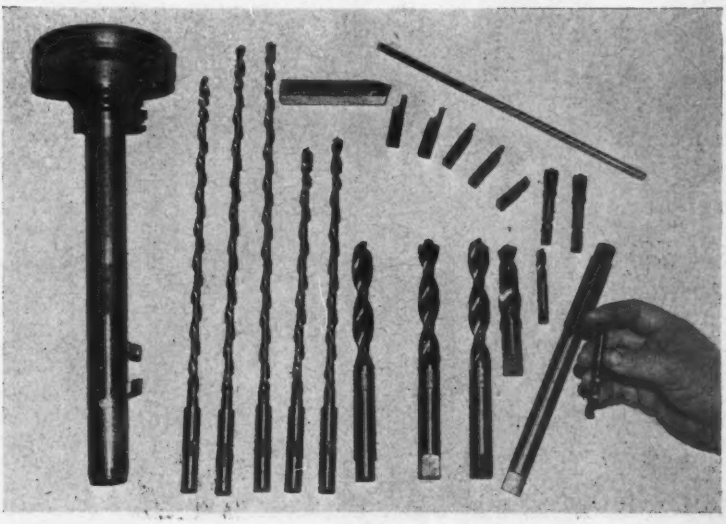


Fig. 4. Some examples of special tools for operations on aluminium cylinder blocks. Tube drills for oil-gallery holes are seen towards the left. The tap seen held in the hand has deep spiral flutes

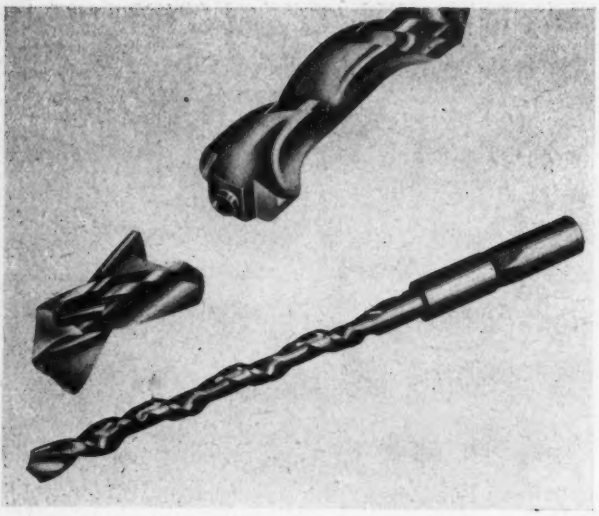


Fig. 5. Single-flute Bi-Tip tube drill for oil-gallery hole. The replaceable high-speed steel tip is brazed to the shank and a large coolant supply duct ensures an ample flow

becomes single flute for maximum chip clearance.

The single-twist portion has a fairly small helix angle to aid chip discharge. Cutting lips on the drill are ground concave in a special Royal Oak form-relieving fixture, as seen in Fig. 6, and the front edge is relief-ground. With this drill shape, the chip normally breaks into small flakes, which are readily discharged up the flute. A speed of 3,500 r.p.m. is employed for drilling.

Oil-gallery drilling is carried out on a W. F. & John Barnes transfer unit shown in Fig. 7, which was rebuilt for the 4,100 engine. For this operation, the casting is turned crosswise on the transfer line and is drilled from both ends. In addition to the gallery holes, several shallower holes are drilled simultaneously by the multiple-spindle heads. Because the opposing oil-gallery holes meet in the centre of the block, the feeds are timed so that one head drills to its maximum depth and begins to retract before the opposing drill reaches the break-through point. For the return strokes of both drill heads the spindles are stopped. The drills are so long (19 in.) that whipping might cause them to break if they were allowed to run unsupported at full speed.

Cast-iron engine components were machined dry, but for the aluminium castings the use of soluble-oil emulsion has been essential to prevent sticking and welding of the chips to cutter tips and bodies, to cool and lubricate the work and the tools, and to improve finish. To ensure that the chips will not stick, a 6 per cent solution of soluble oil is employed throughout the production lines, and whereas this high concentration adds to the cost, it has been found to be fully justified.

While the application of the soluble-oil emulsion has proved beneficial, its introduction on the cylinder block and crankcase line presented problems. This line, as has been ex-

Fig. 6. A special form-relieving fixture on the drill grinder produces a concave profile on the cutting lips and thins the central web to enable straight holes to be obtained at high rates of penetration. The concave lips cause the chips to curl and break

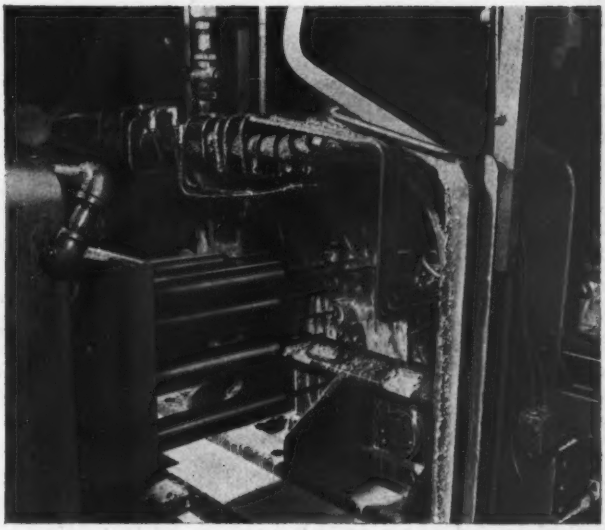


Fig. 7. Both ends of the crankcase are drilled by means of multiple heads on this rebuilt W. F. & John Barnes machine. Drills up to 19 in. long are employed for the oil-gallery holes. It will be noted that coolant is directed to the back of the bush plate as well as to the cutting edges of the drills

plained, comprises, for the most part, equipment which was formerly used on cast iron and has been converted. Precision switches, relays, and other electrical units required no special protection when cast iron was machined dry. With the soluble-oil emulsion, however, owing to the high pressure and high cutter speed, there is much splash and spray, which originally penetrated the electrical units and prevented them from functioning correctly. Some of the units could be moved to positions clear of the spray, some were shielded, and others had to be waterproofed, so as to overcome the trouble. The comparatively high coolant pressure, it may be noted, was found to be necessary to dislodge chips.

Chip handling on the aluminium crankcase and cylinder block line has proved to be a greater problem than with cast iron. Chips from the latter material crumble, but the chips from aluminium are ductile, and although chip-breakers are used wherever possible, the production of long, feathery chips is sometimes inevitable. When roughing cuts are taken at high surface speeds, large volumes of chips are discharged and effective shielding is by no means easy. A further problem is presented by the fact that some of the cuts on the cylinder end faces, for example, necessarily produced a mixture of cast iron and aluminium swarf. Consequently, there are three different kinds of swarf—

Fig. 8. A Natco machine at the extreme left provides for core drilling the camshaft bearing seatings, also for cutting the front-end oil-seal and slinger grooves for the crankshaft. At the right is seen a special press supplied by Detroit Broach & Machine Co. for the insertion of the camshaft bushes

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cast iron, aluminium, and a mixture of the two—which must be collected, accumulated, and returned separately to the foundry.

One of the new machines, to which reference has previously been made, was supplied by Natco and part of it is visible on the extreme left in Fig. 8. This machine provides for core-drilling the camshaft bearing seatings in preparation for the insertion of the white-metal-lined bushes, also for cutting the front-end oil-seal and slinger grooves for the crankshaft. The grooves are rough and semi-finish machined at adjacent stations which are equipped with special Scully-Jones recessing tools. When these cutters have been advanced into position, they are fed radially outwards by hydraulic cylinders, depths of cut being controlled by positive stops. At the groove semi-finishing station, the centre thrust bearing seat is finish machined.

Insertion of the five bushes in the camshaft bores is performed semi-automatically with the equipment seen at the right centre in Fig. 8 which was built by Detroit Broach & Machine Co.

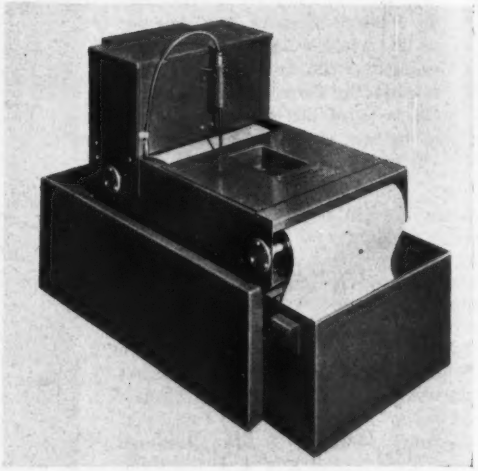
Another of the new machines was supplied by the Barnes Drill Co. for finish-honing the cylinder bores, and is seen in the heading illustration. The cast-iron cylinder liners, it may be noted, are previously bored on a Moline transfer machine which was re-built by Sundstrand Machine Co., to suit the type 4,100 cylinder block and crankcase. On the honing machine, all the spindles are vertical to assist in maintaining roundness of the bores.

The castings are carried into the machine by a walking-beam type transfer mechanism and are clamped in an orientating carriage. In this carriage the cylinder block is tilted to bring one bank of cylinders into alignment with the first set of four honing spindles. Subsequently, the block is transferred to a second carriage whereby the other bank of cylinders is aligned with the second set of honing spindles. The bores are honed to a surface finish of 25 to 40 micro-inches.

Philips Universal Coolant Clarifier for Small Grinders

A new universal coolant clarifier with a capacity of 200 gal. per hr. has been added to the Philips range, which is distributed in this country by Alfred Herbert, Ltd., P.O. Box 30, Edgwick Works, Coventry, and Research & Control Instruments, Ltd., Instrument House, 207 Kings Cross Road, London, W.C.1.

Known as the type 7733/24, this clarifier, which is shown in the accompanying illustration, is primarily intended for use in connection with small surface grinders. The various features of other Philips universal clarifiers have been incorporated, but instead of a float-operated switch an electrical probe is employed for switching on the motor which advances the filter medium when it has become clogged. When the coolant held on top of the filter comes into contact with this probe, an electric circuit is closed, and the motor is thus automatically brought into operation.



The Philips type 7733/24 universal coolant clarifier of 200 gal. per hour capacity is primarily for use with small surface grinders

NEW KETAY INDICATING INSTRUMENTS. Two new dial-type instruments have recently been introduced by Ketay, Ltd., Eddes House, Eastern Avenue West, Romford, Essex, a member company of the Plessey Group. These instruments are intended for applications where it is required to display, or repeat, information of an angular or linear type, remote from the source. The basic instrument has a 3-in. diameter dial, and a square mounting flange, and can be operated in conjunction with Ketay synchro torque transmitters of various types.

The standard scale calibration for angular indication is from 0 to 360 deg., with 2-deg. graduations, but alternative markings can be provided to suit customers' special requirements. Accuracy is within ± 1 deg. The other new instrument incorporates two synchros, and is served by two transmitters. With this arrangement, coarse and fine readings of angular or linear movement can be displayed and repeated.

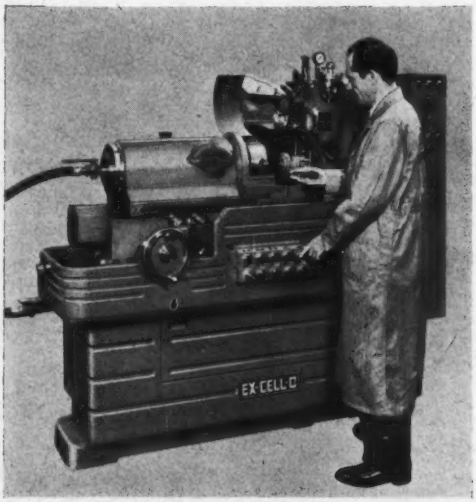
NEW PRODUCTION EQUIPMENT

Edited by
G. W. Mason
and
A. J. Barker

Ex-Cell-O Type 39-A Precision Internal Thread Grinding Machine

The Ex-Cell-O Corporation, Detroit, Mich., U.S.A., who are represented in this country by Ex-Cell-O Corporation (Machine Tools), Ltd., Hastings Road, Leicester, have recently built the No. 39-A precision internal thread grinding machine shown in the accompanying figure.

This machine is suitable for work of a wide diameter range, and to permit the necessary range of spindle speeds to be obtained, provision is made for the use of interchangeable spindle units. One of the available units is of the company's standard precision type, and is normally arranged to give a speed of 15,000 r.p.m., although other speeds can be obtained by changing the belt pulleys. The alternative unit is a Bryant high-frequency type, the spindle speed of which can be varied from 42,000 to 60,000 r.p.m. A tank and pump are provided for circulating cooling water to the latter unit.



Ex-Cell-O type 39-A precision internal thread grinding machine, which is equipped with interchangeable spindle units

A wide variety of right- and left-hand threads, with single or multiple starts, can be ground, and after setting the wheel position at the begining of each working cycle, the grinding operation is performed automatically.

Hurth Type SRS 400 Grinder for Gear Shaving Cutters

In the illustration is shown the type SRS 400 machine introduced by the German firm of Carl Hurth, for grinding involute tooth profiles on gear shaving cutters.

Cutters from 3⅜ to 15¾ in. diameter, which have a maximum face width of 1⅜ in., and from 15 to 240 teeth, with diametral pitches from 25 to 1½, can normally be handled on this machine. If required, provision can be made for grinding cutters down to 1⅛ in. diameter. During the grinding cycle, the work-head slide is reciprocated in a transverse direction on the bedways, the drive being taken from a 2-speed motor of ½/¾ h.p. through a crank and connecting rod which ensures smooth reversals. At the same time, an oscillating motion is imparted to the cutter, to provide for grinding the involute shape, by the action of two steel tapes, which are secured at one end to a fixed part of the machine, and at the other to a drum mounted on the spindle. Interchangeable drums of different diameters, to suit the cutter to be ground, can be mounted on the spindle. The work-head slide has a maximum travel of 7⅜ in., and four traversing speeds are obtainable, which enable 15, 20, 30, and 40 cutter teeth per min. to be ground. The slide can be inched by a push-button controlled slow-speed drive, and the cutter can be adjusted in relation to the grinding wheel by hand, with reference to a dial indicator, for setting up.

The work-head spindle is mounted in two preloaded ball bearings, and indexing is effected automatically under the control of a dividing disc. The spindle may be turned through one or more complete revolutions during the automatic grinding cycle, at the completion of which the machine is stopped.

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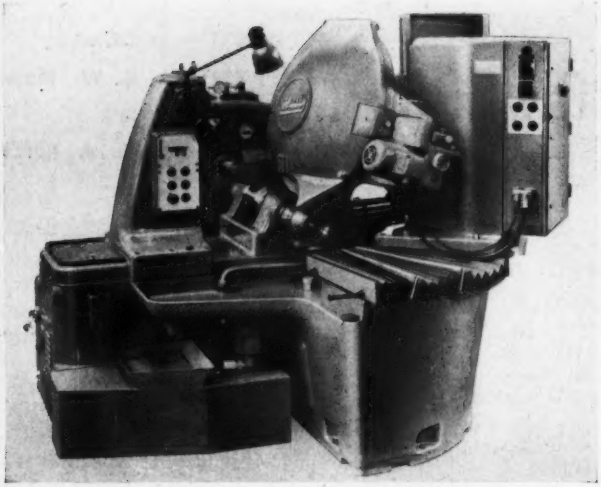


Hurth type SRS 400 grinding machine for gear shaving cutters of 3⅛ to 15¾ in. diameter and 1 5/16 maximum face width

A grinding wheel of 30 in. maximum diameter may be mounted on the spindle, which runs in bearings of ample size, and is driven at a speed of 690 r.p.m. by a 1½-h.p. motor. Because a large-diameter wheel is employed, only a small amount of wear takes place while one cutter is being ground. Consequently, the involute shape can be maintained to a high degree of accuracy on all the teeth. The wheel-head has a maximum adjustment of 9½ in. on the column ways, and can be tilted through a maximum angle of 16 deg. above and 5 deg. below the horizontal position. Mounted on arcuate bedways, the column assembly can be swivelled in the horizontal plane through a maximum of 35 deg. on each side of the central position, for setting the wheel to suit the helix angle of the cutter teeth. An adjustment of 1 1/16 in. is provided for the spindle quill in an axial direction.

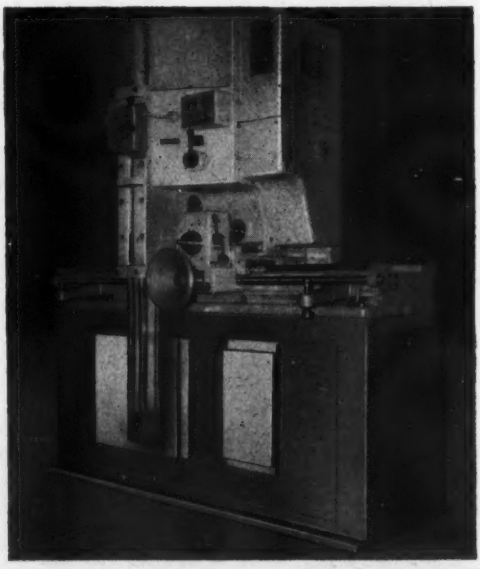
A wheel dressing attachment is mounted on the guard, and different traversing speeds for the diamond slide, as required for taking roughing and finishing cuts on the wheel, are provided by a 3-speed driving motor. The slide moves on cylindrical ball-bearing guideways, which ensure easy movement, and a flat face is normally dressed on the wheel under the control of a straight edge, but profile shapes can be produced with the aid of templates when teeth of modified shape are to be ground on a cutter.

Coolant equipment, or a dust collecting system, can be provided. The machine occupies a floor space of 80 by 96 in., and weighs about 4 tons 2 cwt. The makers are represented in this country by Vaughan Associates, Ltd., 4 Queen Street, Curzon Street, London, W.1.

TOS Type HOT 100 Transportable Slotting Machine

Shown mounted on a cabinet-type base in the accompanying illustration is the Czech-built TOS type HOT 100 transportable slotting machine, which is marketed in this country by Selson Machine Tool Co., Ltd., Sunbeam Road, London, N.W.10.

The vertical, ram-type slotting slide has maximum and minimum stroke lengths of 39⅜ and 11 3/16 in. Main drive is taken from a motor of approximately 5 h.p., which enables a thrust of about 1,750 lb. to be applied when cutting, and slotting speeds of 18 in., 26 in., and 36 in. per min. are obtainable. The return speed is 52 in. per min. Mounted on a compound slide, which is carried by a bed member, the slotting head has a longitudinal traverse of



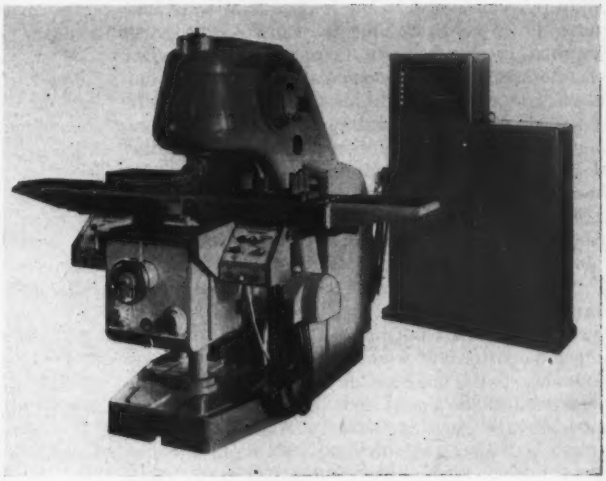
TOS type HOT 100 transportable slotting machine

59 in. and a lateral movement of 9⅝ in. Feeds of 0·0079 and 0·039 in. per stroke are available for both these motions, and a rapid traverse of 33⅜ in. per min. is provided by a separate 1½-h.p. motor.

Jacking screws, carried by outboard supports mounted at the front of the bed, provide for levelling the machine when it is supported on the workpiece, and it occupies an area of approximately 8 ft. by 4 ft. 9 in.

Hüller Type FS5 Vertical-spindle Production Milling Machine

In the illustration is shown the type FS 5 vertical-spindle production milling machine built by Karl Hüller, G.m.b.H., Ludwigsburg, Germany, who are represented in this country by Bishop, Eaves & Sons, Ltd., 868 Alum Rock Road, Birmingham, 8.



The Hüller type FS 5 vertical-spindle production milling machine is here shown equipped for automatic programme control

This machine can be supplied with a 51- by 14-in. work-table, which has a longitudinal travel of 39·4 in., and a cross movement of 11·8 in. Alternatively, a 63- by 15¾-in. table can be provided, and the longitudinal movement then obtainable is 51 in., and the cross travel, 10·8 in. The knee has a vertical traverse of 15¾ in., and the maximum distance obtainable between the top surface of the table and the spindle nose is 18·9 in. The distance between the centre line of the cutter spindle and the column guideways is 15¾ in.

There are 16 feed rates which may range from 0·88 to 28 in. per min. longitudinally, from 0·55 to 17·7 in. per min. transversely, and from 0·29 to 8·8 in. per min. vertically. Alternatively, the longitudinal, cross, and vertical feeds may range from 1¾ to 55, 1·1 to 35·4, and 0·55 to 17·7 in. per min., respectively. Rapid power traverse is provided at the rate of 120 in. per min. in the longitudinal direction, 80 in. per min. transversely, and 40 in. per min. vertically.

Drive for the traverse motions is taken from a 4-h.p. motor, flange mounted on a gearbox, which is housed in the knee and incorporates electromagnetic clutches for engaging the feed and rapid movements. Individual feeds in the ranges provided for the different traverses can be preselected by means of a single dial mounted on the front of the knee, and gear changing for engaging the required feed is effected hydraulically, pressure oil for this purpose being provided by the pump for the automatic lubrication system. From the gearbox, drive is taken by gears to a first motion shaft within the knee. Gears on this shaft can be brought into mesh with other gears hydraulically, under the control of push-button operated solenoid valves, for engaging the traverse motion in the required direction. The first motion shaft is connected by a pair of gears to a single wheel at the front of the knee, which provides for hand adjustment in the longitudinal, transverse, and vertical directions.

Mounted in opposed taper roller bearings at the nose end, and parallel roller bearings at the upper end, the spindle can be supplied to take a No. 5 Morse or a No. 50 steep taper shank, and carries a heavy flywheel, which ensures a smooth cutting action. Drive may be taken from a motor of 13⅜ or 20⅛ h.p. mounted in the inverted position within the column, through a 6-speed gearbox and V-belts to a countershaft, and finally to the spindle by gears. Twelve spindle speeds are available, which may range from either 22 to 1,000 or 33 to 1,500 r.p.m., depending upon the size of the motor, selection being made by levers mounted on the side of the column. An electro-magnetic spindle brake is fitted, and the bearings and driving gears are continuously lubricated.

Spindle drive and the traverse motions can be controlled independently by push-buttons mounted on a panel at the left-hand side of the knee, for setting up and machining single workpieces. Push-buttons on this panel also enable either feed or

rapid power traverse in the longitudinal and transverse directions to be engaged simultaneously. If required, the machine can be operated on a variety of automatic cutting cycles, and different combinations of feed and rapid table traverses can then be obtained under the control of stops adjustably-mounted on detachable carrier plates, in conjunction with switches on another panel at the right-hand side of the knee.

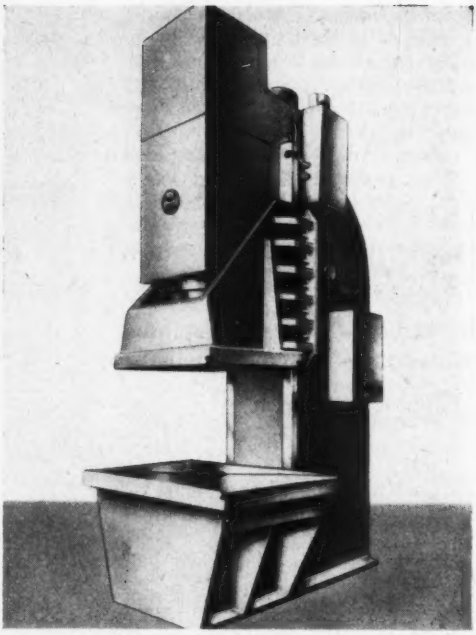
Equipment can be provided which enables the machine to be operated on a fully-automatic programme-controlled cycle, and particulars were given in MACHINERY, 96/88—13/1/60. With this equipment, the various stages of the required cycle are selected by means of a peg-board built into the control unit which is mounted on the shop floor close to the machine, as shown. The pegs are positioned in the board with the aid of a punched card, and the lengths of the traverses of the table, saddle and knee, at the feed and rapid traverse rates, in both directions, are controlled by the stops to which reference has already been made.

A type FW 5 horizontal-spindle milling machine of similar design and capacity is also available, which, like the vertical machine, can be operated on a fully-automatic, programme-controlled cycle if required. A vertical-spindle milling attachment can be provided for this machine, and is designed for mounting in the dovetail guideways, at the upper end of the column, which normally take the over-arm. A driving motor of 5·4 or 7½ h.p. may be fitted, and the five spindle speeds obtainable may range from 71 to 280 or from 142 to 560 r.p.m. The spindle may be bored to take a No. 4 Morse or a No. 40 steep taper shank, and the maximum distance obtainable between the nose end and the top surface of the table is 20·7 in. Maximum and minimum distances of 12·8 and 8·27 in. are obtainable between the centre line of the spindle and the column guideways.

OMF-Ferralba 250-ton Hydraulic Press

Rushworth & Co. (Sowerby Bridge), Ltd., Clough Works, Sowerby Bridge, Yorks., are the sole agents in this country for the Italian-built OMF-Ferralba Delta open-sided hydraulic presses, of all-steel welded construction. The 250-ton size from this range is shown in the accompanying illustration. It has a table surface measuring 51 by 40 in., and a stroke of 39⅜ in.

The hydraulic supply is provided by a multi-piston pump driven by a motor of 15 h.p., and an automatic valve provides for rapid filling and exhausting of the cylinder during the idle portions of the stroke. An adjustable slide stopping arrangement is incorporated in the system. Large bearing



OMF-Ferralba Delta 250-ton hydraulic press

surfaces are provided for the piston and slide, and the guides for the latter are protected by steel covers. Push-buttons for controlling the press are mounted either on the side of the upright, or on a pendant at the front, and operate a servo-motor. Alternatively, a manual control lever can be fitted. The operating speed is 15 strokes per min.

Equipment available for this press includes ejectors and a blank holder for mounting under the table, and an all-steel press brake attachment which enables lengths up to 9 ft. 10 in. to be folded.

A press of similar design, but of 150 tons capacity, is also made. It has a table surface of 41 by 29 in., a stroke of 27⅝ in., and an operating speed of 25 strokes per min. The press brake attachment for this machine has a length capacity of 6 ft. 7 in.

Craven Friction Roller Drive Wheel Lathe

Craven Brothers (Manchester), Ltd., Vauxhall Works, Reddish, Stockport, have recently introduced the friction roller drive wheel lathe, with profiling equipment, shown in the accompanying figure. This machine is intended for re-turning,

with carbide tools, brake and skid-hardened wheel sets, with plain or roller journal bearing axle boxes in position.

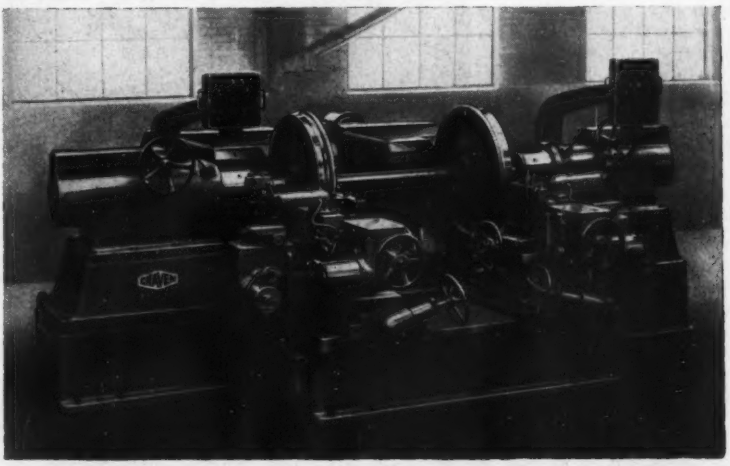
The wheel set is carried between revolving centres, and the patented driving arrangement comprises a pair of friction rollers for each wheel. These rollers, which are tapered and engage the wheel rim at an angle, are mounted in independent, opposed sliding blocks, and the latter are hydraulically operated to provide a fully balanced self-contained thrust for transmitting the required driving torque. Adequate adjustment is available for each pair of rollers, to suit wheels of different widths.

Separate saddles, which carry the friction rollers, are advanced in unison to the driving position, and are electrically tripped to maintain correct relationship between the driving rollers and the tread, within the wheel diameter range of the machine.

The hydraulic supply for operating the rollers is provided by a motor-driven dual pump unit, and after the grip has been applied, the driving pressure is maintained during the turning operation by one pump only. Drive is taken from a 48-h.p., two-to-one, commutator motor, through a 3-speed gearbox, and the cutting speed range is steplessly variable from 50 to 160 ft. per min.

Craven patent electrically operated profiling equipment is provided for each tool rest. The tool-slides are set to the required spacing by means of gauges, and have transverse adjustment to suit the wheel diameter. Power feed and quick power traverse are provided in both the longitudinal and transverse directions, for each tool-slide, by separate variable speed motors, and when profiling is in progress these motors are automatically controlled by the tracer head stylus and template.

The machine illustrated has a capacity for wheel sets of 4-ft. 8½-in. gauge, and wheel diameters from 36 to 60 in., loading and unloading being carried out by means of an overhead crane or similar lifting equipment. Alternatively, the machine can be equipped with tool slides which can be moved outwards under power, to enable wheel sets to be rolled in, and raised to centre height by lifting jacks.



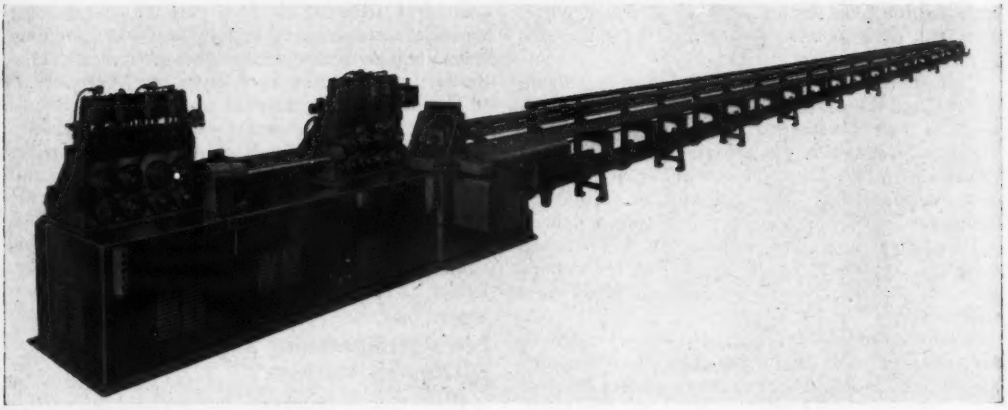
Craven friction roller drive wheel lathe with electrically-operated profiling equipment

Lewis Straightening and Cutting-off Machine

The Lewis Machine Co., Cleveland, Ohio, U.S.A., who are represented in this country by Gaston E. Marbaix, Ltd., Devonshire House, Vicarage Crescent, London, S.W.11, have recently added to their range the high-speed straightening and cutting-off machine shown in the figure. Designated the No. 12-FA, the machine has a capacity for circular-section bar up to 1 in. diameter, which can be drawn from a coil, and the first to be built has been supplied to a large steel mill and provides for a maximum cut-off length of 60 ft.

Straightening is performed by a series of dies housed in a carrier which can be rotated about the work axis at either of two speeds. Drive for the feed rolls is taken through sliding gears, which provide 8 feed rates from 115 to 350 ft. per min., and these rolls are held against the work by a push-button-controlled, air - operated arrangement, which ensures that the ends of coils are drawn through without twisting. The air-operated clutch and brake for the crank-type flying shear are controlled by a sensitive switch. This switch is set in conjunction with an accurate length gauging system, and is operated by the leading end of the work.

The machine is suitable for straightening both cold drawn and hot rolled material and ex-



Lewis straightening and cutting-off machine, for circular-section bar up to 1 in. diameter

traction equipment can be supplied to remove any detached scale when the latter is being handled. With an overall length of 85 ft., the machine illustrated weighs approximately 21 tons.

Bliss High-speed Gap-frame Presses

In the accompanying figure is shown the smallest of a new range of high-speed gap-frame presses which has been introduced by E. W. Bliss (England), Ltd., City Road, Derby. There are seven machines in the complete range, with capacities up to 75 tons, and that illustrated exerts a force of 10 tons at a point near the bottom of the stroke. A choice of three speed ranges is available, namely 100/300, 150/450 and 200/600 strokes per min., when running continuously. Of the non-geared type, the drive to the crankshaft is taken through a Miraclo flat belt to an air-operated friction clutch which is coaxial with a separately-mounted air-operated brake.

The main frame is a one-piece high-duty iron casting, and is mounted on a cast base of similar material. Pneumatic counterbalancing is provided for the slide, which moves in phosphor-bronze V-type gibs and is arranged for cross-bar knock-out. Provision is made in the frame design for mounting a pneumatically-operated die cushion.

Of 5¾ by 4¾ in. face dimensions, the slide has a stroke of 1½ in. and a manual adjustment of 1¾ in. The shut height, with a 1½-in. thick plain bolster in position, and with the stroke down and the adjustment up, is 5¾ in. A 1½ in. diameter recess is provided in the slide face to receive a punch stem. The bed area is 11½ by 15½ in. and there is a 5- by 9-in. aperture. A clearance of 6 in. is provided from the centre of the slide to the throat of the main frame, and the width of the opening in the back of the frame is 8 in.

Complete control of all the functions of the press is afforded by the free-standing console seen at the left in the figure, which incorporates the various push-buttons and rotary switches.

The Bliss type 10HS high-speed gap-frame press is the smallest from a new range with capacities up to 75 tons

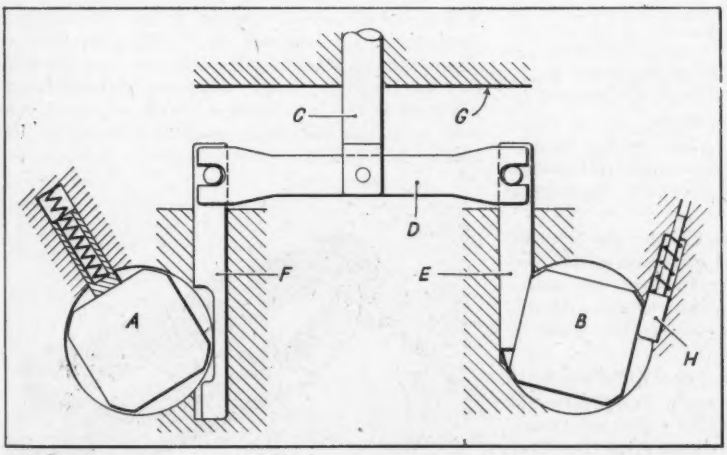
Machine Shop Patents

MECHANISM FOR AN INDEXING CHUCK

The accompanying illustration shows, diagrammatically, a chuck mechanism whereby a workpiece may be indexed successively to four positions about an axis at right angles to the axis of rotation, which is coincident with the centre line of rod *C*. Jaws for gripping the workpiece are mounted on the end faces of rectangular-section locating blocks *A* and *B*, here shown turned through 90 deg. from their actual positions, for purpose of illustration. These blocks may be turned about a common axis, and are, in effect, "connected" when a workpiece is inserted between the jaws. Indexing is begun by movement, in the upward direction, of the rod *C*, which may be operated by an air cylinder, for example. Motion is transferred through the cross bar *D*, with the result that the wedge bar *E* and the bar *F* are also moved upwards. In this way, the lower edge of a recess in the latter is engaged with a corner of the associated block, the assembly, comprising both blocks, the jaws, and the workpiece, thus being rotated. This movement is, however, restrained by the pressure exerted upon a face of the block *A* by a spring-loaded plunger, and the cross-bar, which is pivotally connected to the rod *C*, is thus caused to swivel in an anti-clockwise direction, ensuring rapid withdrawal of the wedge bar *E* until the upper end contacts the stop face *G*. Subsequently, the upper end of the recessed bar also contacts this face, and further upward movement of the linkage is prevented. In this position, the assembly has been turned through 60 deg., and the surface of a portion of the bar *F*, below the recess, engages the face of the associated block to prevent over-running due to inertia.

Motion of the rod *C* is now reversed, and due to the pressure exerted by a second spring-loaded plunger *H* upon a face of the block *B*, the cross-bar is again swivelled and thrusts the recessed bar downwards until its lower end contacts a stop. Further movement of the rod *C* then thrusts the wedge bar downwards, the inclined surface of the latter engaging a face of the associated block and causing the assembly to be turned through a further 30 deg. On completion of the rotary movement, the assembly is located and gripped by the combined action of the wedge bar and the plunger *H*.

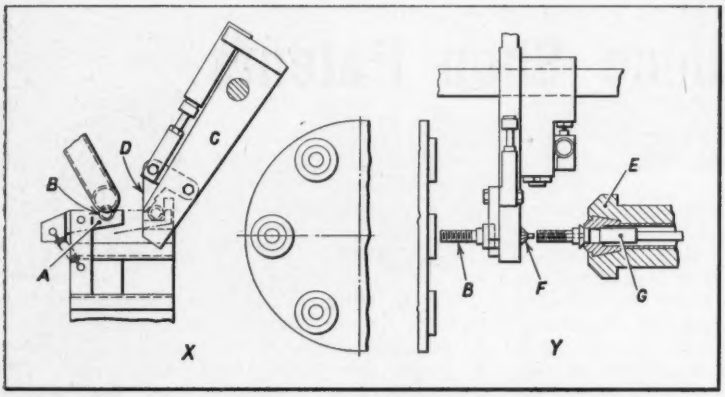
855,447. Alfred Herbert, Ltd., Canal Road, Foleshill, Coventry. (Inventors Mr. D. R. Smith and Mr. R. A. Fox.) *[Application date, August 22, 1957. Published November 30, 1960.]*



Diagrammatic illustration of a chuck mechanism for indexing a workpiece successively to four positions about an axis at right angles to the axis of rotation

AUTOMATIC LOADING ATTACHMENT FOR A MULTI-SPINDLE CHUCKING AUTOMATIC

The accompanying drawings show an arrangement whereby workpieces are transferred automatically to the chucks on a multi-spindle automatic, and provision is also made for an additional operation, such as deburring the rear end of a drilled hole.



End and side elevations of an automatic loading arrangement for a multi-spindle chucking automatic, with provision for back-deburring the machined parts

Workpieces are fed to the machine through a guide tube, and are deposited, in succession, in a groove in the carrier lever *A*, view *X*, as indicated at *B*. At the beginning of a fresh cycle, this carrier, which is mounted on a transverse slide, is traversed to the right, to the position shown by broken lines. In this way, the workpiece is placed in an L-shaped member attached to the rear face of the transfer arm *C*. This member forms the fixed jaw of a clamp. Next, compressed air is admitted to a small cylinder mounted on the transfer arm, and the bell-crank lever *D* is swung in an anti-clockwise direction, to grip the workpiece.

The transfer arm is pivoted at the upper end on a longitudinal cylindrical bar, and it is now swung in an anti-clockwise direction, to align the workpiece with the spindle at station No. 6. The carrier lever *A* is pivotally mounted on the slide, and the end is depressed against spring tension during the transfer movement. After completion of this movement, the arm is allowed to dwell for a short period.

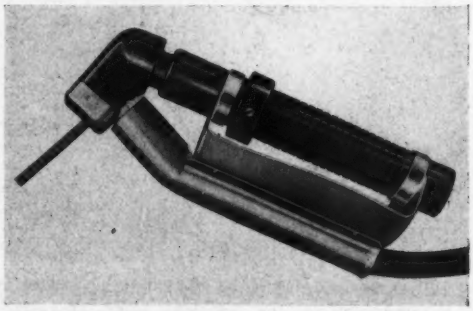
Referring now to the view *Y*, from the front of the machine, the arm is next traversed to the left, along the overhead pivot bar, to thrust the workpiece into the chuck. The arm is subsequently traversed to the right and then swung outwards to the original position.

After the series of machining operations has been completed, and the spindle again indexed to the station No. 6, the auxiliary spindle *E* is advanced. This spindle carries a collet which grips the outer end of the work, and the chuck on the main spindle is released. The auxiliary spindle is then withdrawn to the position shown. A fresh workpiece is now transferred in readiness for loading into the chuck, and during the dwell period of the transfer arm, mentioned earlier, the auxiliary spindle is advanced for a short distance, and the rear end of the machined workpiece is deburred on a cutter *F* mounted on the arm. The auxiliary spindle is again withdrawn, after completion of the operation, and during this movement, the completed workpiece is discharged by the ejector rod *G*.

857,806. Wickman, Ltd., Banner Lane, Tile Hill, Coventry, and R. J. Dixon, L. Jones and J. S. Riley. *[Application date October 23, 1958. Published January 4, 1961.]*

Terrier 600 Electrode Holder

An improved electrode holder, shown in the accompanying illustration, which, it is stated, remains quite cool when heavy-gauge electrodes are being used at high amperages, has been introduced by Interlas, Ltd., 9 Church Street, Ampthill, Bedford. It is known as the Terrier 600 special, and a feature of the design is that the cable is carried to the head of the holder through an aluminium painted metal shield, and not through the handle. The cable is protected by asbestos adjacent to the head and is almost in direct contact with the electrode, so that heating of the holder is avoided.



Terrier 600 special heavy-duty electrode holder

Reversible 2-speed Geneva-drive Mechanism

By SIGMUND RAPPAPORT

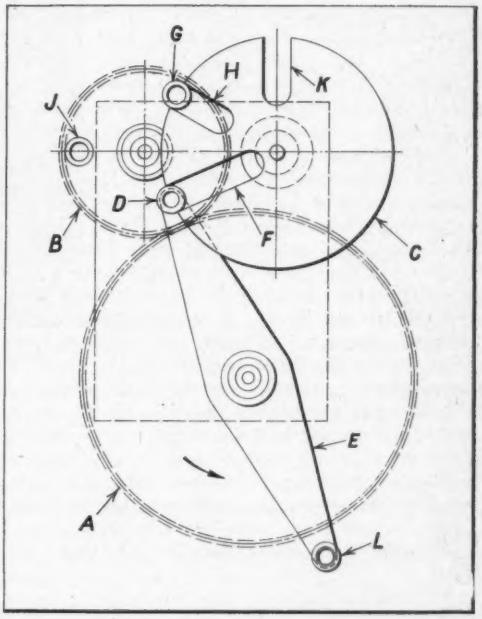
A REVERSIBLE 2-speed Geneva-drive mechanism was designed for imparting an intermittent reversing rotary motion to a prism to be incorporated in a proposed design of aerial camera. It was specified that the prism should rotate in the following sequence: (1) turn 60 deg. anti-clockwise; (2) stop momentarily; (3) turn an additional 60 deg. anti-clockwise; (4) stop momentarily; (5) turn 120 deg. clockwise; (6) stop momentarily; and then repeat the cycle. Furthermore, it was required that the driving motor should be of the constant speed type, and that the transition between rest and motion should be shock-free.

Referring to the accompanying plan view, the mechanism comprises a Geneva disc *C*, with three slots, and two spur gears. The smaller gear *B* has two free running rollers, and the larger gear has a lever *E* secured to one face. There is a free-running roller at each end of the lever, and the ratio of the numbers of teeth on the two gears is 2 to 1.

In the figure, the mechanism is ready to start the cycle described above, and it should be noted that the gear *A* is secured to the output shaft of the constant-speed motor, and rotates continuously in an anti-clockwise direction. When the drive is engaged, the roller *D*—on one end of the lever *E*—leaves the slot *F* in the disc *C*. Gear *B* is driven in a clockwise direction by gear *A*, with the result that the roller *G* enters the slot *H* and turns the disc *C* through 60 deg. anti-clockwise. As the roller *G* leaves the slot *H*, the disc *C* stops momentarily, until the roller *J* enters the slot *K*, and turns the disc through a further 60 deg., also in the anti-clockwise direction.

At this stage, the gear *B* will have turned through 240 deg., but since the gear ratio is 2 to 1, the gear *A*, and the lever *E*, will have turned through only 120 deg. As a result, the roller *L* is in a position to enter the slot *F*, which is now 120 deg. in an anti-clockwise direction from the position shown. While the roller *L* is in engagement with the slot *F*, the disc *C* is turned through 120 deg. in a clockwise direction, and the elements are returned to the position shown, in readiness for the next cycle.

It should be noted that the design is such that the rollers on the gear *B*, and on the lever *E*, are arranged to enter their respective slots in a truly radial direction, to ensure a shockless transition from rest to motion. Because the radius of operation of the roller *D* is more than twice that of the rollers *J* and *G*, movements of the disc *C* in the clockwise direction are made at a faster speed than movements in the anti-clockwise direction. There are no locking arcs on the Geneva disc *C* since the design is such that one of the free-running rollers is always in engagement with a slot. The mechanism can be operated at speeds up to 250 r.p.m.



Diagrammatic plan view of a reversible 2-speed Geneva-drive mechanism. The gear *A* is driven continuously in an anti-clockwise direction by a constant-speed motor

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IMPORTS OF AIRCRAFT ENGINES during 1960 reached a total value of £29,318,848, the principal suppliers being the U.S.A. (£7,689,683) and the Commonwealth (£4,159,243).

Wiest Universal 6-spindle Drum-type Indexing Machine

THE GERMAN FIRM OF WILHELM WIEST, who are represented in this country by Embassy Machine & Tool Co., Ltd., 248 Watford Way, Hendon, London, N.W.4, have recently added the type WS 406/U indexing drum machine, shown in Fig. 1, to their range. This machine is intended for operations on valve bodies, pipe fittings, and other components in steel and non-ferrous metals, on which machining is to be carried out on three sides.

Occupying a floor space of 65 by 90 in., the well-ribbed cast iron base has an overall height of 18¼ in., and the entire top surface is machined to permit the cutter heads to be set in different positions, for the machining of various types of components. There is a cut-away portion in the base, which enables the operator to stand close to the 4-station indexing drum, so that the fixture which has been brought to the top position can be easily reached for loading and unloading workpieces.

The drum, which may be seen more clearly in the close-up view Fig. 2, is supported at both sides by large-diameter bearings, to ensure high stability when heavy cuts are being taken, and when cutting tools break through parts which are being machined from the solid. It is indexed by a Geneva mechanism, in a cycle time of about 1·2 sec., and is located, positively, at each working position by a plunger. Jaw pieces for gripping the work are attached to arms secured to a pair of self-centring slides which move in guideways at each working station on the drum. The arms are located on the slides in two directions at right-angles by keys, and provision is made for adjusting the jaws of each pair independently. In addition, the entire assembly can be adjusted on the drum. The clamping force can be varied from a very low value for holding fragile, thin-wall, components, up to a maximum of approximately 3,000 lb., which enables heavy cuts to be taken when machining workpieces from the solid. During the final part of the indexing motion of the drum, the jaws on the fixture which is being brought to the unloading position, are automatically opened by a pawl at the rear. This pawl is engaged by a lever which can be moved to the working position by either an air-operated or a hydraulic cylinder.

Two sets of three unit spindle heads are mounted on the base. The heads in one set provide for turning and boring, and those in the other, for cutting internal and external B.S.P. screw threads up to 1¼ in. diameter in steel and 1½ in. diameter in non-ferrous metals. They have an overall length of 29½ in., a width of 10 in., and a height of 27 in., and can be adjusted independently on sub-bases by means of screws. An adjustment of about 4 in. is provided for the thread-cutting units.

For each turning and boring unit, drive is taken from a 2-speed motor of 3/3·8 h.p., through V-belts and stepped pulleys, and six spindle speeds are available which range from

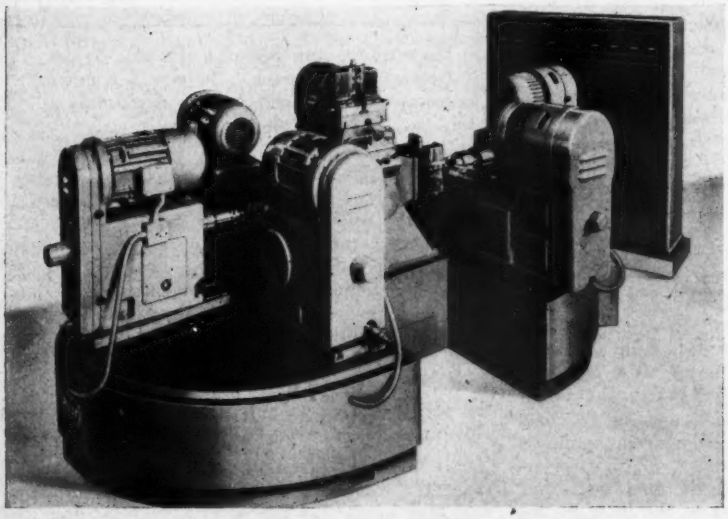


Fig. 1. Wiest type WS 406/U indexing drum machine for valve bodies

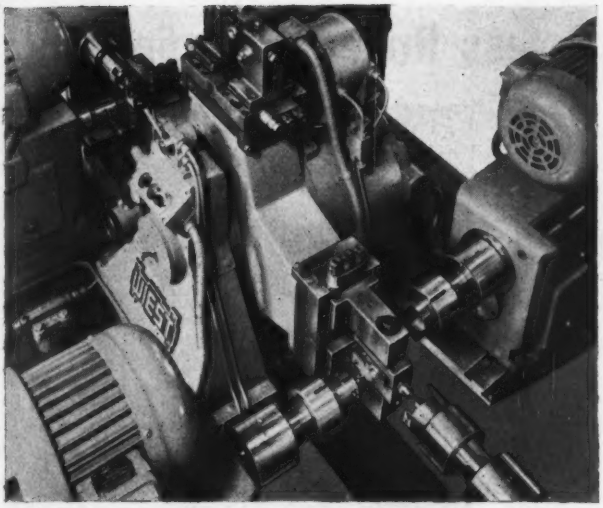


Fig. 2. Close-up view of the drum portion of the machine shown in Fig. 1

700 to 2,800 r.p.m. The maximum working stroke is 4¾ in., and the feed motion is derived from a screw, driven by a chain and sprockets. Interchangeable sprockets can be fitted, which enable different feeds in the range from 0·0005 to 0·018 in. per rev. to be obtained. Feed and rapid power traverse are automatically engaged at the required points in the working cycle by oil-immersed electro-magnetic clutches, controlled by limit switches, which are operated by adjustable stops.

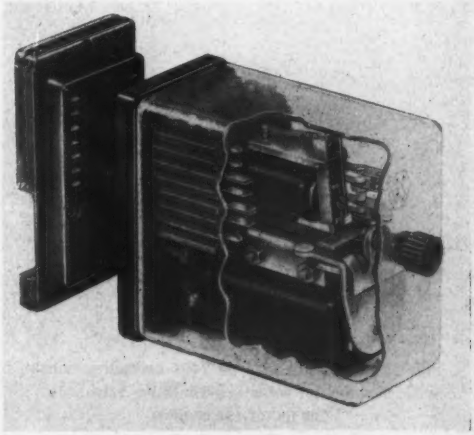
Spindle speeds from 200 to 500 r.p.m. are provided for the screw-cutting units, the drive being taken from 2-speed, 2-h.p., reversing motors. The higher motor speed is brought into use for rapidly returning the spindle to its starting position at the end of the screwcutting stroke. These units enable right- and left-hand screw threads to be cut. Button-type dies are usually fitted for cutting external threads, but provision is made for using self-opening die-heads, if required. The working stroke, up to a maximum of 3¼ in., is controlled by limit switches in conjunction with adjustable stops, and interchangeable leadscrews and nuts can be fitted to suit the pitch of the threads to be cut.

Provision is made for the heads to be brought into use successively during the automatic cycle, for example, when a hole is to be bored in the work for half its depth from each side. Controls incorporated in the electrical equipment, which is housed in a separate, floor-mounted cabinet, can be set so that any number of heads, up to a maximum of six, can be employed in different combinations, during the working cycle.

C. & S. Plug-in Latching Relay

A plug-in latching relay with electrical release, as shown in the figure, has recently been added to the range made by Clifford & Snell, Ltd., for which D. Robinson & Co., Ltd., 717 London Road, Hounslow, Middlesex, are sole distributors. With this relay, a short pulse supplied to the main coil results in a change in the contact positions which persists until a pulse is supplied to the release coil.

Both coils are continuously rated, and can be operated from D.C. or A.C. Up to three change-over contacts, or five pairs of make or break contacts can be fitted. All materials employed, including the transparent cover, are non-inflammable, and the unit is stated to be suitable for use under tropical conditions.



C. & S. Plug-in type latching relay which is suitable for operation from D.C. or A.C. supplies

Hegenscheidt Centreless Roller Superfinishing Machines

IN FIG. 1 IS SHOWN the type 7401 centreless machine, which has been introduced by Wilhelm Hegenscheidt, K.G., Erkelenz/Rhld., Germany, for roller superfinishing valve stems for motor-car engines.

Designed for operation on a fully automatic, electro-hydraulically controlled cycle, this machine will handle valves with stems from ¼ to ⅝ in. diameter, and from 3 to 6 in. long. The working area is normally enclosed by a hinged guard fitted with a window, through which the operation may be observed, and during the cycle, a copious supply of lubricant is delivered to the rolls. There are two superfinishing rolls, and a single, larger-diameter driving roll, which runs at 450 r.p.m. to give a peripheral speed of 270 ft. per min.

Valves to be superfinished are loaded on to inclined guide rails at the rear of the machine, down which they pass by gravity, to be delivered, one at a time, to the rolling position by way of a solenoid-operated escape mechanism and transfer arrangement. The driving roll is now advanced towards the superfinishing rolls to apply a pressure of 4,200 lb. to the valve stem. Fig. 2 is a close-up view of the work-loading arrangement and the rolling head, and a valve in the superfinishing position may be seen at *A*. Because the driving roll is set at a slight angle to the superfinishing rolls, a through-feed motion is imparted to the valve during the working cycle. At the end of the cycle, the valve operates a micro-switch, with the result that the driving roll is returned to its original position, and because the entire head is inclined, the completed valve is discharged from the rolls by gravity, and passes down an inclined chute at the front of the base.

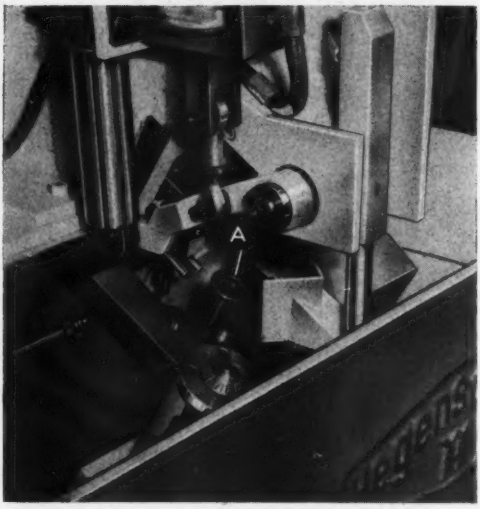


Fig. 2. Close-up view of the work-loading arrangement and the rolling head on the machine shown in Fig. 1

Fig. 1. Hegenscheidt type 7401 centreless automatic machine for roller superfinishing valve stems for motor-car engines

The machine stops when the supply of components on the guide rails has been exhausted. Push-buttons and switches are conveniently grouped on a panel at the front of the bed for controlling the various motions independently when the machine is being set up. A floor space of 31 by 43 in. is required for the machine, which has an overall height of 56 in., and weighs about 25 cwt.

The semi-automatic centreless machine, illustrated in Fig. 3, has been introduced by the com-

pany for roller superfinishing a variety of components by the plunge or through-feed methods. Machines to accommodate parts from $\frac{3}{4}$ to $3\frac{15}{16}$ in. diameter can be supplied.

The part is supported at its outer end by a pair of rollers mounted on a bracket secured to the base, and a friction drive is provided by a large diameter roll carried on a horizontal shaft in the column. Superfinishing is performed by two small-diameter rolls, which are backed up by three larger-diameter rolls, and a close-up view of this assembly, mounted in a carrier, is given in Fig. 4. Interchangeable carriers and roll assemblies can be mounted on a head which can be moved downwards hydraulically to apply a variable pressure to the work. The head may be swivelled about a vertical axis for setting the superfinishing rolls at a slight angle in relation to the driving roll, for applying a feed motion to the work in the axial direction. In addition, the roll carrier can be tilted on the head by a small amount, to obtain "tear drop" shaped contact surfaces between the superfinishing rolls and the workpiece, and a scale is fitted to facilitate setting.

Tilting of the carrier to give the "tear drop" shaped contact surface, results in variations in the depth of penetration across the width of the rollers, and, as was pointed out in an article in MACHINERY,

Fig. 3. Hegenscheidt semi-automatic centreless machine for roller superfinishing

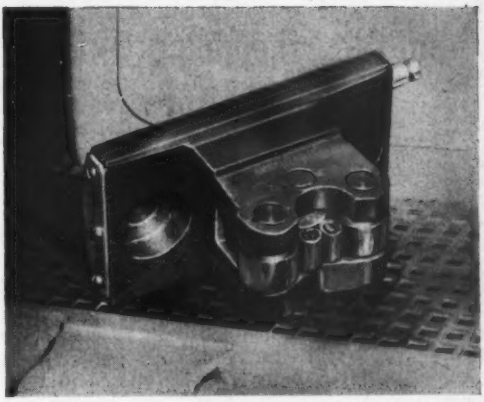


Fig. 4. Close-up view of the roll assembly and carrier for the Hegenscheidt machine illustrated in Fig. 3

90/1385—21/6/57, the work is subjected to different actions, which are broadly as follows:—

(*a*) IN THE ROLLING-IN ZONE pressure is applied by the leading edge of the rollers, and there is a slight swelling of the work-surface in advance of the zone.

(*b*) IN THE ZONE OF PLASTIC DEFORMATION the rollers penetrate to the full depth and the highest pressure is applied.

(*c*) IN THE SMOOTHING ZONE the straight faces of the rollers (which are set at a slight angle to the workpiece) gradually recede from the work-surface, until, at a point well in advance of the trailing edges of the rollers, contact ceases.

It is important that there should be a smoothing zone if a high-quality surface finish is required.

A gauge is fitted to facilitate setting the contact pressure between the rolls and the work. When superfinishing has been completed by the through-feed method, the workpiece operates a limit switch, with the result that the roller head is raised clear, and the driving roll is stopped.

Elgar Machine Tool Co., Ltd., 172-178 Victoria Road, London, W.3, are the agents in this country for Hegenscheidt roller superfinishing machines.

DIESEL AND DIESEL-ELECTRIC LOCOMOTIVES.—During the first nine months of 1960, a total of 529 diesel and diesel-electric locomotives was added to the operating stocks of the British Transport Commission. The corresponding figure for the whole of 1959 was 601, and for the whole of 1958, 400.

Tool for Assembling O-rings in Deep Bores

By WILLIAM E. WOELFEL

FOR MOST APPLICATIONS, the grooves to house O-ring seals can be incorporated in the external surface of a shaft or cylinder, and the assembly of the rings then presents little difficulty. Occasionally, however, this procedure is not practical, for example, when the shaft or cylinder is hollow and the wall thickness is insufficient to accommodate the grooves. In these circumstances, grooves must be provided in the bore of the mating part, and if a groove requires to be located at some distance down the bore, trouble may be experienced in inserting the O-ring, mainly on account of inaccessability. An assembly problem of this type arises in connection with wet-sleeve liners for diesel engines, and the tool shown in Fig. 1 is designed to facilitate the insertion of the rings without damage.

The tool is seen in position in the bore of a cylinder block *A*, in which there are two grooves to receive O-rings. Attached to a tubular shaft *B*, there is a cylindrical member *C*, which is a close sliding fit in the bore. The member *C* has eight radial holes, the inner ends of which connect with similar radial holes in the shaft *B*. Within the radial holes in the part *C* there are plain sliding plungers *D*, the outer ends of which abut four arcuate-shaped shoes, indicated at *E* in Fig. 1, also in the sectional view on the line *X-X*, seen in Fig. 2. These shoes are restrained from falling out of the member *C* by means of small-diameter transverse pins as at *F*.

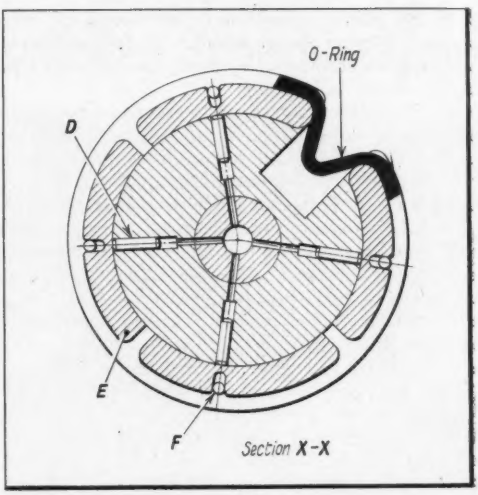


Fig. 2. Cross-sectional view through the part *C*, Fig. 1, showing the arcuate shoes and the slot which is provided to house the excess length of the O-ring

On the shaft *B* there is a pilot disc *G*, which is arranged to register in the mouth of the cylinder bore and incorporates a flanged portion. The disc *G* is secured to the shaft in such a position that when its flange abuts the end of the cylinder the O-rings in the member *C* are coincident with their mating grooves. An O-ring assembled to the tool in readiness for insertion can be seen in Fig. 2, where it will be noted that the excess length is contained in a slot machined at one point in the member *C*.

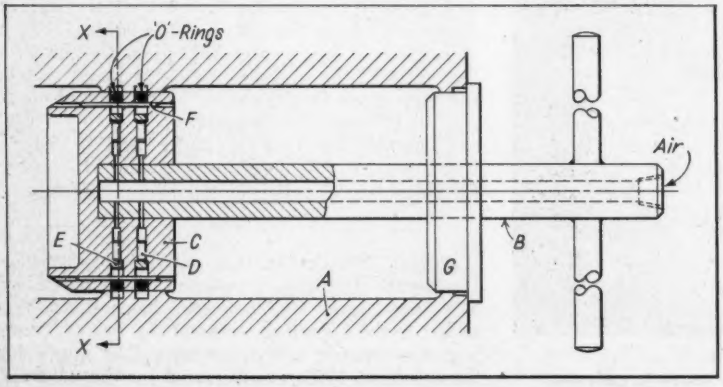


Fig. 1. Sectional view of a tool for assembling O-rings in deep bores

In operation, the tool, complete with O-rings, is inserted in the cylinder bore until the flange on the disc *G* locates it lengthwise. Next, compressed air is admitted to the outer end of the shaft *B*, with the result that the plungers *D* are blown outwards radially. Consequently, the shoes are also moved outwards, and the O-rings are pressed into the grooves. Finally, the

tool is turned slowly, by means of the handle welded to the free end of the shaft *B*, and the O-rings are thus " ironed " smoothly into their grooves. When the air pressure is released, the complete tool can be carefully removed from the bore. The air supply can be controlled by a pedal-valve, so that the operator's hands are left free for manipulating the tool.

Hydro-Titan Axial Piston Units

Keelavite Hydraulics, Ltd., Allesley, Coventry, have recently acquired the selling rights for Hydro-Titan axial piston units in the United Kingdom and the British Commonwealth. Built by Louis de Roll Iron Works, Ltd., Zurich, Switzerland, these units can be employed as hydraulic pumps or motors, with constant or variable delivery or speed, depending upon the mounting and control arrangements. There is a range of 16 units, which provide outputs from 3·9 to 2,800 gal. per min. when used as pumps, at maximum pressures from 2,000 to 2,500 lb. per sq. in. continuous rating, and from 3,500 to 5,000 lb. per sq. in. intermittent rating. When used as motors, the units have output torques ranging from 9·5 to 54,700 lb.-in. per 100 lb. per sq. in of input pressure.

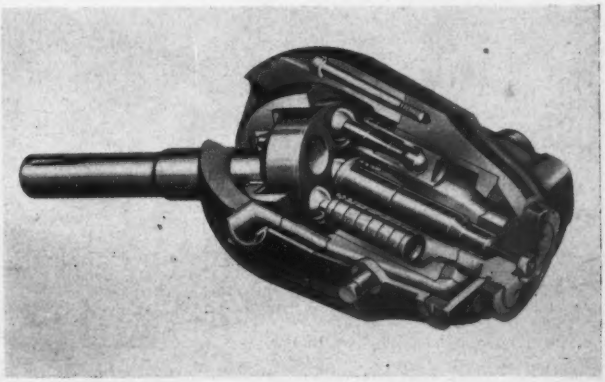
A typical variable-capacity unit is shown in section in the accompanying illustration, and it incorporates seven pistons, which are connected by ball-and-socket joints to a flange on a main driving shaft. The pistons move in a cylinder barrel which is free to rotate in a housing, and the latter unit can be swung from a position that is co-axial with the driving shaft to vary the piston stroke. At the end remote from the shaft, the cylinder barrel bears against a timing plate in which there are two kidney-shaped ports.

With the cylinder barrel co-axial with the driving shaft, the shaft and pistons rotate about a common axis, so that there is no displacement of the pistons and therefore no delivery of oil when the unit is used as a pump. As the cylinder barrel is swung from the co-axial setting, displacement of the pistons takes place, the piston travel being approximately proportional to the angle of the cylinder barrel to the shaft. During half a revolution of the driving shaft, each piston in turn draws oil into the associated cylinder from one of the ports in the timing plate, and during the other half revolution, the oil is discharged, under pressure, through the other port. These ports are connected by channels in the body of the unit to inlet and outlet orifices. Direction of flow is reversed by swinging the housing from one side to the other of the co-axial position.

Fixed capacity units are available without provision for swinging the housing and cylinder barrel relative to the shaft, and it will be appreciated that when a supply of pressure-oil is connected to the inlet port, the shaft is driven at variable or constant speed, depending on the type of unit.

Each variable capacity unit is supplied in a casing with the housing for the cylinder barrel mounted on trunnion bearings. Various methods of adjusting the angular setting of the housing are available, the simplest being by handwheel and screw. An electric motor may be substituted for the handwheel, and may be controlled manually —by push-button switches, for example—or automatically. Cams and limit switches may be fitted to provide for predetermined output settings of the housing.

The position of the housing may also be controlled by a push-pull arrangement, through a sliding stem. Means must be provided by the user for moving and locking the stem, and arrange-



Sectional view of a Hydro-Titan axial piston hydraulic pump/motor unit

N

ments can be made for hydraulic adjustment, in a generally similar manner, under either manual or automatic control. By means of a suitable hydraulic control system, the output of the pump unit may be automatically adjusted to give either a constant pressure or a constant horse-power delivery.

Adjustment by hydraulic cylinder may be used as a basis for servo-control, with lever-operated or direct feed-back to a pilot valve. More complex arrangements, which are suitable for electronic control through a transducer valve, are available.

When it is necessary to operate units at speeds higher than—or at inlet heads less than—those permissible with incoming oil at atmospheric pressure, positive pressure can be applied to the inlet port. The boost pressure will depend on the size and speed of the unit, but is generally within the range of 50 to 100 lb. per sq. in., and units with built-in boost pumps can be supplied.

Continuous Casting of Aluminium Bar*

By A. H. TESSMANN†

THE EQUIPMENT SHOWN IN FIG. 1 has been developed for continuous casting 2¼-in. diameter aluminium alloy bar for conductor applications, at the rate of 80 in. per min. Cast bar is pulled clear of the mould by a pair of motor-driven pinch rolls, and is then cut into 30-ft. lengths by a flying saw, which is traversed in a horizontal direction. The pieces cut off are subsequently hot rolled to ⅜ in. diameter.

Molten aluminium from a Russ induction furnace is delivered by way of a holding furnace to the 4- by 12- by 8-in. deep trough shown at *A* in the sectional view Fig. 2. From the trough, the metal is passed through the 1¼-in. diameter nozzle *B* to the 36-in. long tubular mould *C*, which is made from copper, annealed, polished in the bore, and then chromium plated to a thickness of 0·004 in., to reduce the risk of the molten aluminium sticking during casting. The holding furnace can be tilted for pouring, and will take a maximum of 5,000 lb. of aluminium, which is maintained at the casting temperature by Nichrome elements in the roof. Metal is discharged from the holding furnace through a screw-type valve, the needle and seating of which are made from a special ceramic, which has an exceptionally high resistance to wear.

The trough *A* can be swivelled about the centre line of the nozzle *B* for discharging molten metal, if required, and, as can be seen more clearly in the enlarged-scale sectional view Fig. 3, it is fitted with a cast iron sleeve *D*, which surrounds the nozzle. Made from refractory material, the nozzle is bell-mouthed at the right-hand end to facilitate discharge of molten aluminium into the mould.

During the casting operation, the mould and the surrounding casing is continuously reciprocated through a distance of 3 in. by means of cams, driven from the motor and gearbox which provides the drive to the pinch rolls. Movement of the assembly in the direction of casting occupies 2 sec., and the return travel, ½ sec. The casting speed is 80 in. per min.

Vegetable oil—usually

* Abstract of an article published in the Journal of the Institute o Metals, 1960-61, vol. 89.

† President of the Industrial and Research Development Corporation, Chattanooga, Tenn., U.S.A.

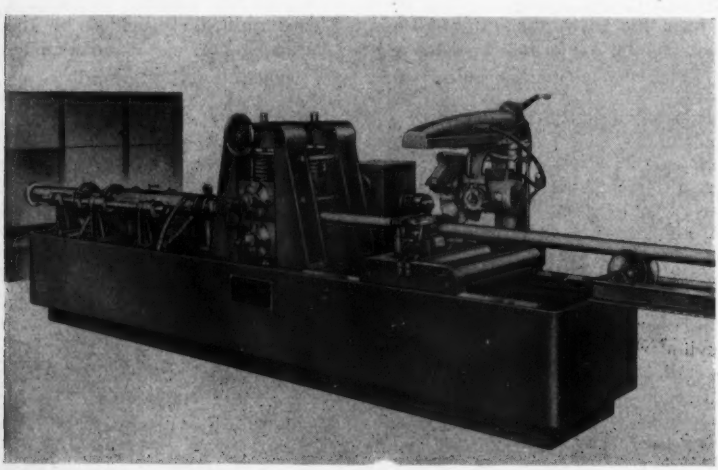


Fig. 1. Equipment for continuously casting 2¼-in. diameter aluminium alloy bar at the rate of 80 in. per min.

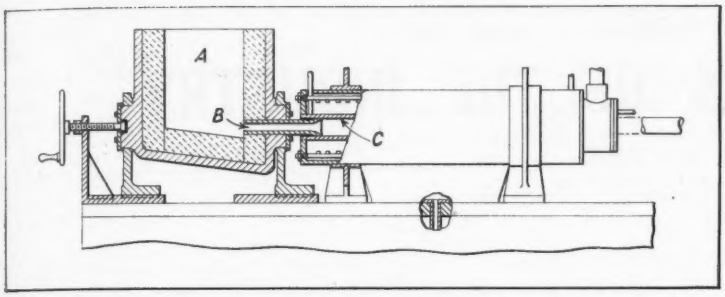


Fig. 2. Sectional view of the pouring trough, nozzle, and mould on the equipment shown in Fig. 1

castor or rape seed—is delivered through the pipe *E* for lubricating the mould, to prevent the molten metal sticking, and water, for cooling, is directed on to the outer surface of the mould through pipes and nozzles housed within the casing. Water is also delivered, under pressure, through another pipe into the space between the periphery of the cast bar and the bore of the conical baffle member *F* attached to the vacuum chamber *G*, which is secured to the right-hand end of the mould casing. This supply serves to cool the cast bar, and forms an air seal between the bar and the baffle member, and vacuum in the chamber *G* assists in the distribution of the lubricant in the bore of the mould, and removes any gas which is formed as a result of decomposition of the oil, and possibly some gas from the metal itself.

When the metal solidifies, some shrinkage takes place. Consequently, there is a small clearance between the bar and the mould. Movement of the lubricant and gas in this space under the influence of the vacuum, assists in cooling the bar, and obviates the risk of re-melting in a zone adjacent to the pool of molten metal, which extends into the bar for a distance of 5 in.

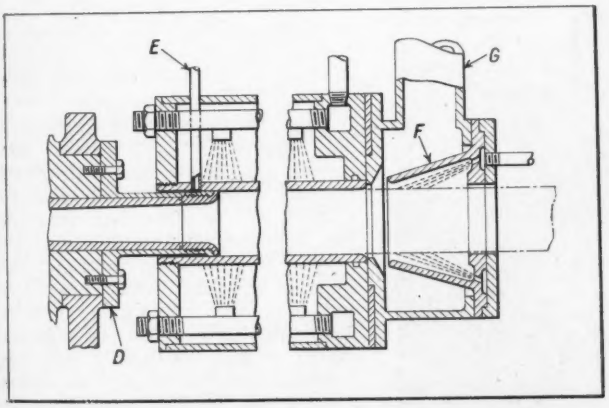


Fig. 3. Enlarged sectional view of the pouring and discharge ends of the mould for continuous casting of aluminium

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HILFLON P.T.F.E. SEALING TAPE has been introduced by William Rose, Ltd., Hilyn Works, Lockfield Avenue, Brimsdown, Middlesex, and is intended particularly for use as a sealant for threaded pipe joints. The tape, which is 0·003 in. thick, is supplied in rolls approximately 40 yd. long by ½ in. wide. In use, tape is simply wrapped round the male threaded member of a pipe joint, and the female unit is then screwed on. Since the tape has a coefficient of approximately 0·04, the joint can be unscrewed readily even after long periods of service. The tape is chemically inert and non-toxic, impervious to water and steam, unaffected by a wide range of acids and solvents, and is not inflammable. A number of advantages are claimed for its use in place of conventional sealing compounds.

DRESSER-DRI OIL AND GREASE ABSORBENT. Magnus Chemical Co., Ltd., Salisbury Road, Trading Estate, Uxbridge, Middlesex, have been appointed sole concessionaires for the United Kingdom and part of Europe for granular attapulgite, which is marketed under the name of Dresser-Dri. It is stated that this specially processed mineral has been employed for some years in American industry for keeping floors clean in areas where oil spilling is unavoidable.

The material is dust-free and is intended to be sprinkled on oily floors. After the oil has been absorbed the material is swept up and may be used repeatedly until it has become saturated. In this state it has absorbed up to two-thirds of its weight of oil. Even when impregnated with oil, it is claimed, Dresser-Dri will not catch fire.

NEWS OF THE INDUSTRY

Keighley and District

LANDIS LUND, LTD., Eastburn Works, Cross Hills, report that the volume of orders and enquiries for their range of grinding machines and fine boring machines is satisfactory. An extensive works building and reorganization programme has recently been completed, which has involved the installation of a number of machine tools from the U.S.A.

Among the machines seen in progress in the works was a valve plate grinder equipped with an automatic feeding unit; various sizes of cylindrical grinders including a type P.B. machine fitted with a 24-in. diameter wheel and having a length capacity of 125 in.; an I.W.R. Landis-designed multi-wheel grinder for crankshafts; and a number of single and multi-head fine boring machines.

We were informed that machines recently despatched from the works have included two Landis-designed crankpin grinders for the car industry, and a H.M.P.H. type grinder for South Africa. This latter machine was equipped with a 10½-in. wide wheel for plunge grinding railway wheel axles.

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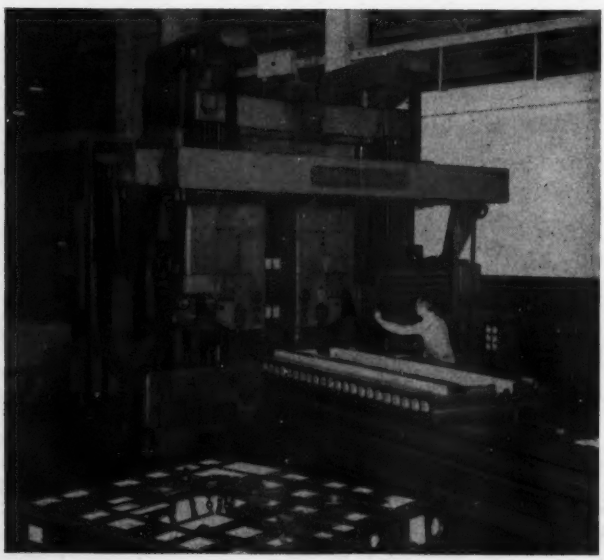
This modified Giddings & Lewis plano-milling machine, which is installed in the company's plant at Fond du Lac, Wis., U.S.A., has a hydraulic compensating system to provide automatic correction for any deflection of the cross-rail due to the weight of the heads. With this arrangement, as the heads approach the centre, the cross-rail is raised and it is stated that it is possible to mill surfaces flat, transversely, within 0·001 in. over the full width capacity. Work up to 6 by 6 by 20 ft. can be handled and each of the four heads is driven by a 50 h.p. motor. Feed rates for the table range from 0 to 250 in. per min., and for the heads, from 0 to 125 in. per min.



KEIGHLEY GRINDERS (MACHINE TOOLS), LTD., Aireworth Works, Aireworth Road, Bradford Road, report an unparalleled demand from both the home trade and the export markets for all the grinding machines in their range. In the works we noted, in addition to the standard type machines, a modified grinder equipped with a 30-in. diameter wheel and adapted for grinding a crankpin on a special component, and an internal grinder for shipment to France, which has an automatic wheel dressing device for performing three dressing operations per cycle.

To enable the finish on machines to be improved, the company has recently re-equipped the fettling and painting departments with modern plant. A new fitting and assembly bay, of some 5,000 sq. ft., was also seen in the course of erection, and we were informed that machine tools and equipment recently installed in the machining departments have included an Archdale milling machine; a Dean, Smith & Grace type 21 centre lathe; a type 340.T. horizontal boring machine built by Giddings & Lewis Machine Tool Co., U.S.A.; a large capacity Snow surface grinder; a

Swift-Summerskill open-side planer; a 12-in. by 48-in. capacity plain cylindrical grinder of the company's own make; and a 48-in. capacity Webster & Bennett turning and boring mill.

A. FIELDING & Co. (KEIGHLEY), LTD., Airedale Works, Bradford Road, report a continued steady demand for their 16- and 18-in. swing centre lathes from both the export and home markets. Other activities of this company include the building of special machine tools and equipment to suit the individual requirements of their customers.

HEWITT & TOPHAM, LTD., Foster Road, Ingrow, are experiencing a heavy demand for their services as gear specialists from a wide range of industries. They have facilities for the production of spur gears up to 48 in. diameter, bevel gears up to 25 in. diameter, and worm gears up to 12-in. centres. Products of this company also include a range of worm gear reduction units with a ratio range from 10:1 up to 60:1, and we are informed that a stock of right-angle bevel drive units is maintained, to provide a prompt service to industry, as this type of unit is in constant demand.

WALTER SLINGSBY & Co., LTD., Woodhouse Road, report an increasing call for their range of malleable castings and forged steel components, intended for use mainly in the heating engineering and allied trades, where a considerable amount of pipe-work is involved. We are informed that export figures are steadily maintained as a number of these products are used in oil refineries throughout the world.

In the works our attention was drawn to an automatically controlled, oil-fired, galvanizing plant, which has recently been supplied by Thompson Brothers (Bilston), Ltd. An addition to the equipment in the metal and wood pattern-making department is a Hayes Tracemaster T.M.43. machine, and new equipment in the production shops includes a Sentinel 3-head boring and tapping machine, an A.M.T. two-head multi-spindle boring machine, and a Landis-Maiden threading machine.

D. MITCHELL & Co., LTD., Central Iron Works, Parson Street, report a continued heavy demand for their range of centre lathes from all parts of the world. We were informed that approximately 40 per cent of machines now on order are for export, including a 22½-in. centre machine with a 24-ft. long bed for the U.S.A., and a 16½-in. by 26-ft. machine for Australia. New plant recently installed in the works includes a Devlieg jig

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3. AVERAGE CIRCULATION PER ISSUE DURING PERIOD where a publication is included in the regular Annual Subscriptions to a Society paid by its members.	Home Overseas	– –		–
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5. Average Circulation per issue during period, where a Publication is included in a reduced rate annual subscription to a Society paid by its members.	Home Overseas	– –		–
	TOTAL PAID			9,827
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	TOTAL			11,293

Authorised for issue by the Council of the Bureau.

Signed ..... Secretary.

Date 24th January 1961

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For 26 years, the circulation of MACHINERY has been audited by chartered accountants, and each year the figures have been published in our columns. On December 16, 1960, MACHINERY joined the Audit Bureau of Circulations, Ltd., and above is reproduced the 26th certificate of circulation, and the first under the auspices of this organization

boring machine and two No. 3 Cincinnati milling machines.

DARLING & SELLERS, LTD., Lawkholme Lane, are busy with the production of various sizes of centre lathes for their associate company, D. Mitchell & Co., Ltd. A Ward No. 8 combination turret lathe has recently been installed in the turning department.

WARD, HAGGAS & SMITH, LTD., Parson Street, report an increase in the demand for their range of lathes and planing machines. We were informed that a large planing machine for Pakistan is now being completed for despatch.

R. SUTCLIFFE.

The Midlands

H. W. WARD & CO., LTD., Dale Road, Selly Oak, Birmingham, who have been engaged in the building of capstan and turret lathes for more than 70 years, continue to experience a satisfactory demand for these machines. The apprentice training scheme, which was instituted here over 40 years ago to provide a 5-year instructional course in theoretical and practical engineering, is very successful, and during the past 20 years more than 400 apprentices have received their training at either the Birmingham or Worcester works. Many of these apprentices now hold executive positions in the company, and in various organizations throughout the world.

MONKS & CRANE, LTD., Garretts Green Lane, Birmingham, 33, report a sustained demand for a wide variety of engineers' small tools, including milling cutters, twist drills, and reamers of many types. Much interest has been shown in Mapal reamers which are made in West Germany and are distributed in Britain solely by this company. They can be supplied for hand or machine operation, and it is claimed that the combined effect of the single cutting blade and two burnishing pads (all of tungsten carbide) is to produce a surface finish in drilled holes of the order of 4 to 7 micro-inches, with stock removal up to 0·030 in. The blade can easily be removed from the shank, ground and re-set.

The machine tool division is still busy, and the range of machines handled is being gradually extended. Recent additions include the Centamax combined centring and facing machine, which is to be distributed on a sole agency basis throughout the British Isles. This machine is designed to accept round bar up to 3¼ in. diameter, also parts of irregular shape.

COLEY BROS. (TOOLS), LTD., The Factory Centre, Birmingham, 30, are still working to capacity on the production of their range of Exacta standardized press tool sets, many of which are supplied with linear motion ball-bearing bushes. Toolmakers' specialities and precision dowel pins in many sizes are other products of the company. The steady upward trend in the demand for die sets has made it necessary to augment the production facilities available to the company, and an additional factory building on an adjoining site has recently been acquired. The heat treatment section at Shirley, near Birmingham, is reported to be busy.

A.M.T. (BIRMINGHAM), LTD., Bristol Road, Birmingham, 29, report a heavy demand for unit heads and a wide variety of special purpose machinery.

MODERN MACHINE TOOLS, LTD., Gosford Street, Coventry, inform us that there is a strong request for their range of machine tools, which includes ⅝-in. and 1¼-in. bar automatics; capstan lathes of ⅝-in. and 1¼-in. bar capacity; an 18-in. by 6-in. surface grinding machine; a thread milling machine for 6-in. diameter external and 7½-in. diameter internal work; and the No. 651 oil grooving machine which is widely employed for producing external and internal curved and straight grooves, also keyways, splines and serrations. This company recently supplied a Modern 909 automatic machine fitted with a magazine for feeding headed bolt blanks to an air-operated collet for end facing, chamfering, and grooving operations. A similar basic machine fitted with a special chuck was delivered to a company engaged in the production of drills for use in coal mining. This machine is employed for turning, grooving and forming the drill bit shanks in a cycle time of 1 min., as compared with 3 min. on the equipment previously employed.

KEELAVITE HYDRAULICS, LTD., Allesley, Coventry, are well occupied with orders for a wide variety of hydraulic equipment which includes pumps, motors, torque actuators, many types of valves, pipe couplings, and self-contained power units. This company specializes in the design, construction, and subsequent installation of hydraulically-operated equipment for mining applications, the machine tool industry, the steel industry, and experimental establishments, for example.

WINSTANLEY & CO. (KINGS NORTON), LTD., Pershore, Worcs., are steadily expanding the production of their Winstan range of guide pins and guide bushes for die sets, some of which can be supplied with cadmium plated finishes to provide improved lubrication properties and greater resist-

ance to corrosion. Normally, sufficient quantities of standard pins and bushes are held in stock to permit despatch to customers by return post, and non-standard items can generally be provided without undue delay. The Winstan press tool die sets, which have recently been introduced, are stated to be in good demand and arrangements have already been made to increase the facilities available for the production of these sets and other specialities.

The existing works have an area of 4,000 sq. ft., and an additional building, on an adjoining site, is in course of construction. Equipment includes Churchill grinding machines, also capstan lathes by Herbert and Ward, a Delapena honing machine, and a Beaver milling machine with special fixtures.

BIRVAC, LTD., Pershore, Worcs., are now well established in new premises after their recent removal from the Birmingham area, and are exceedingly busy with work connected with the design and installation of high vacuum equipment for industrial and other applications. Among the projects undertaken by the company is the building of resin casting machines employed for the production of potted component assemblies, also the design and construction of ovens for semiconductor processing. These ovens are required to operate at a vacuum of 10^{-5} mm. of mercury within a stainless steel chamber, and provide for a work surface temperature of 350 deg. C. The turnover during the past twelve months is stated to have increased steadily, and work is in hand for large industrial organizations and Government departments. Servicing of high vacuum equipment of various types is regularly undertaken.

F. W. HERRIDGE.

Huddersfield

J. GOULDER & SONS, LTD., Albany Road, Kirkheaton, report a continued heavy demand for all gear testing equipment in their range, a good proportion of current orders being for export. Machines now in production include three for Japan, namely, a No. 2 involute tester, a No. 2 V. lead tester, and a No. 2 rolling gear tester. Among other equipment in progress may be mentioned a long-bed lead tester fitted with optical equipment, a worm and wheel testing machine, and batches of standard lead testing machines of various sizes.

Other activities of this company include contract machining for various industries. One of the services offered is jig boring, and the department in which this work is undertaken is equipped with a Société Genevoise Hydroptic No. 6, a Pratt & Whitney No. 2 A., and three Newall jig borers with 36-in. by 24-in. tables, also a Kearns No. 0 horizontal boring machine with extended bed and throat.

A new toolroom has recently been built and the equipment installed includes two Cincinnati No. 2 tool and cutter grinders, a Lumsden 4-wheel grinder, and a Christen drill sharpening machine.

SANDERSON INSTRUMENTS (HUDDERSFIELD), LTD., Prospect Street Works, report a continued increase in the flow of orders for their range of vernier height and depth gauges and caliper type gauges. The majority of these gauges are now supplied with satin-chromium finish on the scales as standard, and with all sliding parts plated with hard chromium.

Current production includes a quantity of gauges for export to India, and we are informed that there is a brisk trade in the graduating of various machine tool scales and dials to customers' individual needs.

To enable the works to satisfy the requirements for increased production a certain amount of new plant is being installed, and delivery of a vertical milling machine is expected shortly.

RELIANCE GEAR CO., LTD., St. Helen's Works, Almondbury, inform us that whereas there is a steady request for their range of worm, spur and helical reduction gears from numerous customers in the engineering industry, a large increase has been noted in the demand for the precision built, modular, servo-mechanism gearboxes.

Recent additions to plant have included a Sykes gear tooth shaving machine, a Hardinge precision centre lathe, a profile grinding machine, and a Myford centre lathe.

R. SUTCLIFFE.

Machining of High-Nickel Alloys

Henry Wiggin & Co., Ltd., Wiggin Street, Birmingham, 16, recently showed in London an informative colour film entitled "Machining Wiggin High-Nickel Alloys," which coincided with the publication of a 68-page booklet (No. 1941) with the same title.

The film and the booklet provide much useful information on the machining of alloys made by the company, and the operations which are discussed include sawing, cutting with abrasive wheels, fusion cutting, turning, milling, drilling, tapping, broaching, precision grinding, thread cutting, thread rolling, and spark erosion. Tables in the booklet give details of the mechanical properties of the various alloys in the range, also particu-

lars of heat treatments which should be carried out in preparation for machining, and cutting speeds and feeds for the different operations. In addition, geometry of cutting tools for drilling, reaming, turning, milling, tapping, thread cutting, and broaching, is discussed, and a separate section is devoted to cutting oils and compounds for various operations.

Copies of the film in the 16-mm. size are available on loan, and copies of the booklet can be obtained, free of charge, on application to the company.

Desoutter Exhibits for Moscow

At the British Trade Fair to be held in Moscow in May and June of this year, Desoutter Bros., Ltd., The Hyde, Hendon, London, N.W.9, will show a complete range comprising 150 portable pneumatic power tools. These tools will include drills, screwdrivers, nut-runners, grinders, nibblers, and shears, and there will also be various stands for bench mounting.

Another exhibit will be a multiple nut-runner incorporating 16 SR50B/500 motors, designed for tightening, simultaneously, all the cylinder head bolts on a B.M.C. 4-cylinder diesel engine. The unit will be suspended by a vertical pneumatic cylinder, and valves and controls from the range produced by Lang Pneumatic, Ltd., one of the member companies of the Desoutter Group, will be employed.

Several consignments of multiple tools, it is stated, have already been sent to the U.S.S.R., and one batch of 21 units is shown in the accompanying figure.

A batch of Desoutter multiple tools being checked prior to despatch to the U.S.S.R.

Shell-Mex "Industrial Notebook" Film

"An Industrial Notebook on Iron and Steel," is the second of a series of "industrial notebook" films, which has been added to the extensive library of Shell-Mex & B.P., Ltd., Strand, London, W.C.2. This film is concerned with a diversity of aspects of the iron and steel industry and includes some shots of historical interest.

It shows, for instance, the old furnace at Coalbrookdale, which was used for smelting iron in 1779 for the first iron bridge in the world, and—in contrast—a modern blast furnace and an electric arc furnace installation for the continuous casting of steel.

Double-flanged railway rails cast in 1767 are portrayed, and sequences are then presented of the laying and welding of 300-ft. rail lengths to produce continuous track for British Railways.

Next there are shots of four beam-type steam engines at Leicester sewage works. Built in 1890, these 200-h.p. engines run at a speed of 11 r.p.m. and each of the flywheels weighs 8 tons. In the film commentary it is stated that some 35 years ago the engineers at the works were told that finance would no longer be available for any major repairs to these engines, which were soon to be placed by modern equipment. Constructed in an era when the possibility of machinery being discarded was never seriously contemplated, however, these engines are still in daily use.

Views are then shown of the 3-cylinder vertical steam engine of 16,000 h.p., which drives the hot rolling mill at the Britannia works of Dorman Long & Co., Ltd., of the beam mill at Lackenby, and of the new steel works in course of construction for Richard Thomas & Baldwins, Ltd., in South Wales.

One sequence is concerned with the Ransomes & Rapier walking dragline at Corby which has a 27-ton bucket and removes overburden at the rate of 1,600 tons per hour to afford access to the ironstone beneath.

Produced by Random Film Productions, Ltd., the film runs for 28 min. and is available on loan in 16- and 35-mm. sizes, in black and white, free of charge, from Shell-Mex & B.P. Film Library.

Books Received

MACHINE PRODUCTION ANNUAL DIRECTORY, 1961. Machine Production and Canadian Supply, 341 Church Street, Toronto, 2, Ontario. [Price 3 dollars.]

Now in its 14th edition, this directory of equipment and supplies for the metal-working and allied industries includes a section in which names of suppliers are listed under the various product headings. There is also a list of manufacturers with the names, of their distributors, dealers or agents in Canada. A separate list give the names and addresses of distributors with an indication of the types of products handled. This year, for the first time, an alphabetical list of trade names has been included.

THE BRITISH COUNCIL ANNUAL REPORT, 1959-60. The British Council, 65 Davies Street, London, W.1. Obtainable from H.M. Stationery Office or booksellers. 110 pp. [Price 2s. 6d.]

In this first part of this report, which is concerned with "the printed word," there are sections on libraries, the Council's publications, information, book exhibitions and book reviews, and Government action to promote book and periodical exports. There follows a general survey of the year in which reference is made, for example, to developments overseas, English language teaching and British education overseas, visitors and students from overseas, specialist tours and advisory visits overseas, the sciences, and the arts.

F.B.I. REGISTER OF BRITISH MANUFACTURERS—1961. Published for the Federation of British Industries by Kelly's Directories, Ltd., 186 Strand, London, W.C.2, and Iliffe & Sons, Ltd., Dorset House, Stamford Street, London, S.E.1. 1165 pp. [Price 50s. post free.]

Now in its 33rd edition, this well known publication gives particulars of the products and services of nearly 8,000 member firms under some 4,500 alphabetical headings. In connection with the classified buyers' guide there are glossaries in French, German, and Spanish, which give translations of all the product terms used. There is also an alphabetical directory which gives names, addresses, and other particulars for all F.B.I. member firms. Other sections of the register are concerned with trade associations, brands and trade names, and trade marks.

HEAT TREATMENT OF METALS (2 vol.). By P. S. Houghton, A.M.I.Mech.E. The Machinery Publishing Co., Ltd., National House, West Street, Brighton, 1. Vol. 1, 156 pp.; Vol. 2, 174 pp. [Price £1 0s. 0d. net per vol.]

Correct heat treatment is most important if an engineering component is to fulfil the function for which it was designed, and an adequate assessment of heat-treatment techniques involves both practical and theoretical considerations. These aspects are systematically examined by the author, who deals with all types of heat treatment for ferrous and non-ferrous metals. In volume 1 the various types of heat treatment are first discussed, also the heat treatment of aluminium, magnesium, and other non-ferrous alloys, and the iron-carbon diagram. Subsequently, grain size, the heat treatment of steel and cast iron, the tempering of steel, and case hardening are considered.

Volume 2 is concerned with hardenability, isothermal transformation, heating for manufacturing processes, furnaces, and the design of components for heat treatment. The text is accompanied by numerous photographs and clear line drawings.

THE DIRECTORY OF OPPORTUNITIES FOR SCHOOL LEAVERS. Cornmarket Press, Ltd. Trade distribution, Bowes & Bowes (Publishers), Ltd., 42 Great Russell Street, London, W.C.1. 288 pp. [Price full bound 9s. 5d., paper-back, 5s. 10d., both post free.]

Following a preface by The Rt. Hon. The Lord James of Rusholme, High Master of Manchester Grammar School, there is an editorial section with articles under such titles as: welcome the bulge; where to get advice; opportunities for girls in industy; going to university; how to apply for a job; and technical training and apprenticeship. In the reference section, which gives concise particulars of companies, their work, and the opportunities that they offer to the school leaver, the number of entries, as compared with the previous edition, has increased by 32 per cent. The number under the heading of electronics, for instance, has risen from 13 to 23, under mechanical engineering, from 31 to 54, and under electrical engineering, from 21 to 32.

There is also a useful classified index in which companies are listed under descriptive headings. Information is here given concerning numbers of vacancies yearly, qualifications, areas in which employment is offered, whether boys or girls (or both) are required, and ages.

HANDBOOK ON ELECTROPLATING (19th Edition). W. Canning & Co., Ltd., Great Hampton Street, Birmingham, 18. Machinery Publishing Co., Ltd., National House, 21 West Street, Brighton, 1. 629 pp. [Price 30s. 0d. net.]

In the latest edition, this well-known book has been divided into three sections concerned with polishing, electroplating, and bronzing and lacquering. Under the heading of polishing are grouped the various mechanical finishing processes which may be carried out in the polishing shop. Electrolytic and chemical brightening of metals, and the treatment of effluent, are also discussed.

By far the largest section is devoted to plating. This section covers cleaning and pickling, and the deposition of nickel, chromium, copper, brass, silver, gold, cadmium, zinc, tin, lead, indium, rhodium, palladium, and platinum. Information is also included on the plating of plastics and non-metallic materials, the anodic oxidation of aluminium, the chromating of magnesium, electrotyping, electroforming, and hard chromium plating.

In the bronzing and lacquering section, the processes of metal colouring and enamelling are also considered.

Throughout the book, numerous tables of useful data are presented, and some fundamental underlying theoretical principles are discussed. As a whole, however, the text is concerned with the correct practical procedures to obtain satisfactory results.

Trade Publications

DAVIS & TIMMINS, LTD., Billet Road, Walthamstow, London, E.17. Well arranged and comprehensive price list of precision fasteners machined from bar. The numerous items, which are clearly indexed, include a variety of brass and steel cut thread screws, hexagon nuts, and turned and stamped washers.

EXPANDITE, LTD., Chase Road, London, N.W.10.—Folder concerned with Philplug heavy fixing devices and compounds. These devices include anchor bolts, stud bolts, and Expanda bolts, which can be employed, for example, for fixing heavy machinery to concrete, brickwork, and masonry.

VACTRIC (CONTROL EQUIPMENT), LTD., Vactric House, Sloane Street, London, S.W.1. Leaflets concerned with the following products: size 08 a.c. motor, size 08 a.c. motor tachogenerator, size 10 a.c. motor tachogenerator, size 11 induction motor, size 11 temperature compensated motor tachogenerator, size 15 a.c. motor tachogenerator, size 07 d.c. motor, and size 11 gearhead.

A. & S. OSMOND, LTD., 13 Dowry Square, Bristol, 8. Leaflet showing representative examples from the company's wide range of sawing and abrasive wheel cutting-off machines. A separate publication is concerned with the type 0/10 high speed abrasive wheel cutting-off machine, which has a 10-h.p. motor and can be equipped with a 14- or 16-in. diameter disc.

THE EQUIPMENT & ENGINEERING CO., LTD., 2 and 3 Norfolk Street, London, W.C.2. Folder devoted to Simplex hydraulic jacks with capacities up to 100 tons; Simplex-Jenny centre hole hydraulic pullers; and Re-Mo-Trol pump and ram units with capacities up to 150 tons for lifting and pulling or pushing in any direction. Another leaflet is concerned with Simplex mechanical jacks of various types.

SUFFOLK IRON FOUNDRY (1920), LTD., Sifbronze Works, Stowmarket, Suffolk. The company's latest price list (No. 11160/N) covers a wide range of products including the recently introduced silver solder No. 38 with a melting point of 620 to 640 deg. and Sifcut No. 40 composite hard surfacing rod comprising tungsten carbide particles in a nickel Sifbronze matrix. Among other items may be mentioned the "Two-in-One Pack" welding and cutting outfit, the Colibri cutting machine, and the all-electric Combi cutting machine.

PROJECTOR SCREENS & TOOLING, LTD., Frith Park, Walton-on-the-Hill, Tadworth, Surrey. Well-presented loose-leaf catalogue describing the products which the company supplies for use in connection with optical gauging. A section is first devoted to methods of chart-gauge layout, types of chart-gauges, and materials. Particulars are then given of grid, radius, tool-room, protractor, and standard thread form chart-gauges, radius and fillet discs, a layout protractor, and an all-magnification projector scale. Prices of these items, and of available layout materials, are appended.

CRODA, LTD., Organic Finishes Division, Cowick Hall, Snaith, Goole, Yorkshire.—Booklet entitled "A Short Guide to Croda Rust Preventive Oils and Coatings." There is an introduction and a list of industrial users, followed by sections concerned with steel producers, spare parts manufacture and storage, small tool industry, export, and miscellaneous. Under each heading recommendations are made as regards the uses of the appropriate Croda products.

LANDIS MACHINE CO., Waynesboro, Penn., U.S.A. Bulletin LHY-10 is concerned with applications of the Lanhyrol thread rolling machine. The information is conveniently presented in conjunction with drawings or photographs of components and close-up and general views of the various set-ups. The first section is devoted to continuous rolling applications, and as an example of the outputs obtainable it may be noted that a 20 UNF class 2A thread, of $\frac{1}{4}$ in. diameter by 0·64 in. long, is rolled on a steel stud for a steering linkage system at the rate of 125 per min. Other sections are devoted to infeed and through-feed rolling applications. At a typical infeed operation, a worm thread is rolled on a $\frac{3}{4}$-in. shaft at the rate of 8 per min., whereas with the previous production method, 4 min. was required to cut one worm.

THE GENERAL ELECTRIC CO., LTD., of England, Engineering Group, Erith, Kent. Publications E67, E75, and E78 are concerned respectively with induction heating furnaces, roller hearth furnaces, and high temperature furnaces with hydrogen atmosphere. The induction furnaces are of mains-, medium-, and dual-frequency types, and are supplied for heating and reheating ferrous and non-ferrous alloys. Roller hearth furnaces are made in a variety of forms, and particulars of some typical standard sizes are given. High temperature furnaces (1,100 to 1,700 deg. C.) can be supplied with molybdenum elements, in continuous and batch types, with ratings from 40 to 160 kW. Small laboratory furnaces with tungsten elements, for temperatures from 1,700 to 2,500 deg. C., are also available.

ROCKWELL MACHINE TOOL CO., LTD., Welsh Harp, Edgware Road, London, N.W.2.—Publication in which attention is drawn to the principal constructional features of the following Hartex grinding machines: hydraulic, universal cylindrical, type RHO; hydraulic cylindrical type RH1, for longitudinal and plunge grinding; hydraulic production cylindrical, type RHP, also a special version with 20-in. diameter wheel; automatic centreless type BED4; and centreless types BED5 and BEF1. Abridged specifications are included also illustrations of typical magazine arrangements. Another well-illustrated publication gives a full description, of the type BED centreless grinder, which is available in two forms. It can be supplied as a through-grinding machine with manual plunge mechanism, and as a plunge-grinding and through-grinding machine with hydraulic plunge mechanism, rapid traverse of the grinding wheel carriage, and long retraction traverse of the control wheel carriage.

Industrial Notes

SMITHS INDUSTRIAL DIVISION, Chronos Works, North Circular Road, London, N.W.2, inform us that their telephone number has been changed to Gladstone 6444.

BRITISH ROTOTHERM CO., LTD., Merton Abbey, London, S.W.19, have acquired additional factory premises at Wimbledon, which are at present being equipped with modern plant. These works will accommodate a machine shop, a dial thermometer production unit, and bulk stores.

THE INTERNATIONAL INSTRUMENTS, ELECTRONICS, AND AUTOMATION EXHIBITION will next be held at Olympia from May 28 to June 2, 1962. Full particulars can be obtained from Industrial Exhibitions, Ltd., 9 Argyll Street, Oxford Circus, London, W.1.

DAVID BROWN CONSTRUCTION EQUIPMENT, LTD., Meltham, Huddersfield, have received an initial order for 22 Turbo Taskmaster aircraft towing tractors from the Royal Netherlands Air Force. These machines are now fitted with the David Brown 42·5 b.h.p. direct injection diesel engines and Brockhouse torque converter couplings.

P.M.T. MACHINE TOOLS, LTD. (formerly Pollard Machine Tools, Ltd.), Oozells Street, Birmingham, 1, have been appointed sole selling agents in the United Kingdom for the range of hydraulic universal grinding machines built by Famir Construzione Macchine Speciali, Via Cristalliera, Torino, Italy.

RESEARCH AND CONTROL INSTRUMENTS, LTD., 207 King's Cross Road, London, W.C.1, have extended their range of Thermocoax miniature thermo-couple wires by the addition of two new and smaller sizes with outside diameter of 0·34 and 0·25 mm. These wires are of Chromel-Alumel, in stainless steel sheaths.

GATE MACHINERY CO., LTD., associates of Elgar Machine Tool Co., Ltd., 172-178 Victoria Road, Acton, London, W.3, are now handling the sales of the following machines:

Nyberg & Westerberg PLS.10 surface grinders.
Peddinghaus Peddy-Shears.
Lazatti LA.60 horizontal borers.

FORDS (FINSBURY), LTD., Kempston, Bedford, have recently received an order from the U.S.A. for 80 presses for making and applying aluminium foil caps for milk bottles. The value of this order is £120,000 and it is stated that the total capping capacity of the presses will be 2,000 million bottles annually.

TECALEMIT, LTD., Plymouth, Devon, can now supply a circular follower plate which fits on to the tube of an air-operated pump, and will follow the grease level in the drum. This plate has been designed for use with the Company's T.B.H. high pressure grease pump and it is claimed that it will prevent cavitation which may otherwise occur with certain heavy fibrous and multi-purpose greases.

THE CAROLINE HASLETT MEMORIAL TRUST, 25 Foubert's Place, London, W.1, announce that Miss L. S. Souter and Miss R. Winslade, joint holders of one of the Trust's travelling exhibitions, will present a paper on "Women Engineers in the U.S.S.R." on February 27, at 6 p.m., at the Institution of Electrical Engineers, Savoy Place, Victoria Embankment, London, W.C.2.

LONG SERVICE AWARDS.—Mr. John Dunlop, O.B.E., C.A., F.F.A., chairman of R. & J. Dick, Ltd., Greenhead Works, Glasgow, recently presented long service certificates and engraved gold watches to seven members of the company who have completed 40 years' service. The number of holders of long service awards was thus increased to 58.

A.S.T.M.E. CONVENTION AND EXHIBITION.—In connection with the 1961 convention of the American Society of Tool and Manufacturing Engineers, 10700 Puritan, Detroit 38, Mich., U.S.A., an exhibition of manufacturing equipment will be held at the New York Coliseum from May 22 to 26 and there will be an engineering conference. It is stated that 250 companies have already reserved space, and it is anticipated that the number will reach 400.

WALTER W. COLTMAN & CO. (BOILERS), LTD., Loughborough, Leics., have introduced a new range of Coltomat oil-fired packaged boilers for steam raising for space-heating or supply to process plant. These boilers are self-contained units with rigid base frames and require no special foundations. The boiler shells are of riveted and welded construction, the fire tubes being expanded into the tube plates.

HEADLAND ENGINEERING DEVELOPMENTS, LTD., Electro-mechanical Division, 10 Melon Road, London, S.E.15, inform us that the range of DiSONtegrator ultrasonic cleaners has been extended by the addition of the system 320 unit with a tank capacity of 5 (U.S.) gal. Other units include the system 40 (which now has a power unit of 80 watts average output) and the system 80, with tank capacities of ½ and 1½ gal., respectively.

ADVANCED PURCHASING COURSE.—The Purchasing Officers Association, Wardrobe Court, 146A Queen Victoria Street, London, E.C.4, will again hold an advanced purchasing course at Christ Church and Pembroke College, Oxford, from April 10 to 14. The course is primarily intended for those holding senior purchasing appointments in industrial and public undertakings. Copies of the programme and registration form can be obtained from the above address.

H. WILLIAMS & SON, LTD., Lark Works, St. Albans, Herts., have been appointed sole agents in the United Kingdom for bandsaw blades made by Hakanssons of Amal, Sweden, and are holding stocks of both coils and endless bands for prompt delivery. Made from high silicon Swedish steel, these blades have precision milled teeth, which are hardened by the induction process. Exceptional toughness, it is claimed, ensures long blade life.

DU PONT COMPANY (UNITED KINGDOM), LTD., 76 Jermyn Street, London, S.W.1, report that neoprene soles and heels are being employed increasingly for safety boots and shoes worn by workers in heavy industry. These soles, it is stated, are not affected by oil and grease, and will withstand temperatures up to 150 deg. C. They are giving good results, for example, in a factory where mineral insulated cable is produced. After this cable has been annealed, lengths are rolled across a marshalling area, while still hot, with the aid of the men's boots.

DAVY-ASHMORE EXPORT CO., LTD., is the title of a new company which has been formed to manage and develop the overseas selling and engineering organization and to promote further extension of the export trade in capital goods of the Davy-Ashmore Group. The address of this company is 15 Portland Place, London, W.1.

BURTONWOOD ENGINEERING CO., LTD., Warrington, Lancs.—It was recently announced that new products are to be added to this company's range, the labour force is to be increased, and additional production facilities are to be provided. The principal object of these developments is to secure an increase in export trade, particularly in oil field equipment. It is anticipated that by the end of this year, the number of people employed will have risen from the present total of 1,000 to about 1,150.

ENGINEERING EQUIPMENT USERS ASSOCIATION, 20 Grosvenor Gardens, London, S.W.1, have published a short pamphlet in which the objects and organization of the Association are concisely described. The activities, it may be noted, include standardization of engineering materials and equipment, also exchange of information and publication of technical documents and handbooks. It is pointed out that the work of the Association is entirely complementary with that of the British Standards Institution, with which close liaison and collaboration are maintained. Copies of the pamphlet can be obtained, free of charge, from the above address.

EARNINGS AND WORKING HOURS IN GERMANY.—In the *Ministry of Labour Gazette* for January some figures were published concerning earnings and working hours in Germany. Under the heading of "metal working," the following were included, the figures (for males) relating to May, 1960. The first figure is the weekly earnings and is followed by the average weekly hours, in parentheses: Steel construction, 219s. (43·8); mechanical engineering, 220s. (43·5); shipbuilding, 237s. 7d. (45·7); road vehicles and aircraft, 232s. 11d. (42·6); electrical engineering, 207s. (43·1); optical and precision engineering, 207s. 1d. (42·9); and iron, steel, sheet metal and metal goods processing, 216s. 10d. (43·6).

Machine Life Finance

A new method of financing major items of industrial equipment over periods related to their useful working life is described in a booklet entitled "Machine Life Finance," which has been issued by Engineering Finance, Ltd., 29 Pall Mall, London, S.W.1, one of the United Dominions Trust group of companies. With this method there is a long-term hire purchase agreement, and the equipment involved is normally the only security. The finance charges are calculated on the reducing balance outstanding at a per annum rate linked to Bank Rate.

Payment for the new machinery can be spread over a long period, normally in monthly, quarterly, or half-yearly instalments, the finance charges being paid quarterly. Terms can be varied to suit the customer's books, and the initial payment, also, is a matter for negotiation in each case. The usual investment and depreciation allowances may be claimed.

The method is intended to apply to equipment with a long working life, such as printing machinery, electronic computers, cranes, and machine tools.

Personal

MR. C. E. POYNTER has resigned from the board of Weatherley Oilgear, Ltd., Biggleswade, after 23 years' service, and is no longer connected with the company.

MR. T. B. O. KERR has been appointed deputy managing director of the General Electric Co., Ltd., Magnet House, Kingsway, London, W.C.2, and Mr. E. H. Davison, financial director of the company.

MR. A. E. REDDELL, O.B.E., M.I.Prod.E., has retired from the board of directors of Vickers-Armstrongs (Engineers), Ltd., and from his office of director-in-charge of the Weymouth works of that company, on reaching normal retirement age.

Coming Events

INSTITUTION OF PRODUCTION ENGINEERS. *Halifax and Huddersfield Section.* February 21, at 7.30 p.m., in the Lecture Theatre, Engineering Tower, Huddersfield Technical College; lecture on "Lubrication Problems on Machine Tools," by G. M. Brown. *Shrewsbury Section.* February 22, at 7.30 p.m., at the New Technical College, London Road, Shrewsbury; lecture on "Production Planning and Control by Computer." *Derby Section.* February 27, at 7 p.m., in the Louis Room, St. James's Restaurant, St. James's Street, Derby; lecture on "Numerical Analogue Control of Machine Tools," by O. S. Puckle. *Stoke-on-Trent Section.* February 21, at 7.30 p.m., at the Grand Hotel, Hanley, Stoke-on-Trent; lecture on "Production and Manufacture of Gears," by R. Hepper.

INSTITUTION OF MECHANICAL ENGINEERS. *Lubrication, Industrial Administration and Engineering Production and Hydraulic Plant and Machinery Groups.* February 23, at 4 p.m., in the Engineering Lecture Theatre, University of Sheffield; lecture on "Performance of Forging Presses," by H. Stern and Cdr. J. I. T. Green.

MANCHESTER ASSOCIATION OF ENGINEERS. February 24, at 6.30 p.m., at the Engineers' Club, Albert Square, Manchester; paper on "'Casteneering,' the Place of Steel Castings in Engineering," by H. W. Keeble.

Broken Delivery Promises

(*Continued from page* 347)

Having accepted the orders with misgivings they may then find that their facilities are unduly taxed. Such an occurrence, however, must not be regarded as an excuse for delay.

Finally, as was emphasized by Sir William, if it becomes evident, despite all that can be done, that late delivery will be inevitable, the customer should be notified as soon as possible and should be given a full explanation of the reasons for the delay.

Machine Tool Exports and Imports

EXPORTS OF MACHINE TOOLS

Type of Machine	Month ended Nov. 30, 1960 Value £	Eleven months ended November 30 1959 Value £	1960 Value £
New, complete—			
Bar and chucking automatics	87,266	686,909	707,434
Boring machines:			
Vertical	228,744	388,065	562,831
Other	82,864	905,580	1,221,308
Drilling machines	94,706	987,177	1,137,142
Gear-cutting machines	124,321	752,779	935,714
Grinding, lapping and honing machines	307,353	2,410,968	2,535,476
Lathes:			
Capstan and turret	261,082	1,629,426	2,069,020
Other	315,463	3,160,499	3,283,057
Milling machines	167,792	1,366,583	1,832,197
Planing machines	16,270	199,904	182,549
Presses:			
Hydraulic	132,645	994,514	1,151,561
Other	200,342	584,439	2,142,502
Punching and shearing machines	152,847	408,815	621,088
Other plate and sheet metal-working machines, including straightening rolls	44,313	409,856	558,749
Screwing and threading machines	49,931	668,641	703,079
Shaping and slotting machines	29,244	376,197	384,983
All other machines	473,290	2,223,251	2,785,472
Used, complete	137,647	1,267,762	1,071,747
Parts	385,254	2,175,391	2,854,486
Total	3,291,374	21,596,756	26,740,395
Destination			
Union of South Africa	126,087	1,000,754	1,189,147
India	684,729	2,847,448	3,771,225
Australia	573,110	3,386,601	5,479,368
New Zealand	88,949	397,352	451,743
Canada	111,561	1,109,190	1,189,692
Other Commonwealth countries	106,134	1,476,278	1,334,585
Soviet Union	76,394	58,363	375,630
Sweden	207,213	263,005	828,772
Western Germany	137,883	626,014	1,101,785
Netherlands	46,646	403,933	605,354
France	121,433	2,539,486	1,483,321
Spain	56,422	288,527	410,684
Italy	187,628	508,617	816,274
United States of America	161,261	2,010,830	2,155,821
Other foreign countries	605,924	4,680,358	5,546,994

IMPORTS OF MACHINE TOOLS

New, complete—			
Bar and chucking automatics	72,481	380,886	548,672
Boring machines	106,243	934,308	1,253,362
Drilling machines	17,539	168,157	306,753
Gear-cutting machines	221,553	782,035	795,302
Grinding, lapping and honing machines	403,555	1,857,756	3,901,423
Lathes	275,993	1,468,516	2,075,623
Milling machines	156,410	2,075,539	2,860,320
Planing, shaping and slotting machines	10,255	221,396	345,991
Presses	358,007	884,322	1,571,255
All other machines	297,140	3,131,064	3,448,910
Used, complete	62,497	700,675	1,212,008
Parts	299,780	2,440,408	2,959,221
Total	2,281,453	15,045,062	21,278,840
Country of Origin			
Western Germany	460,888	5,223,700	5,989,321
Switzerland	203,645	1,822,375	2,765,128
U.S. America	1,261,117	4,773,333	9,106,640
Other countries	355,803	3,225,654	3,417,751

MACHINERY'S ENQUIRY BUREAU

For many years MACHINERY has provided an enquiry service not only for subscribers and advertisers but for all engineers in need of such information as the names of makers—or their agents—of machines or equipment for performing particular operations, suppliers of various classes of material, firms with facilities for undertaking certain types of work, owners of trade names, and agents for foreign machine builders. If you have such a problem write (MACHINERY, Enquiry Bureau, Clifton House, 83-117 Euston Road, London, N.W.1) or telephone (Euston 8441, 2 lines). This service is, of course, entirely free.

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Foreign Languages Translation Services

An article in a recent issue of the *Board of Trade Journal* calls attention to the increasing importance of an ability to conduct business with foreign countries in the languages of the prospective purchasers, and of the need for comprehensive translation facilities for the use of companies engaged in export business. Some details are given of the work undertaken by the foreign languages translation department of the Birmingham Chamber of Commerce both for members and non-members. In addition to ordinary translation work, this department is able to deal with a wide variety of enquiries submitted by Birmingham business organizations, concerned with the use, or interpretation of, foreign language material.

From a comparatively small beginning, the department is now dealing with an average of 6,000 requests per year for written translations, in addition to numerous telephone enquiries for translations of telegrams and even individual words. Since speed is often of considerable importance in securing foreign business, the Chamber is prepared to submit summarized translations by telephone, and in some instances to make telephone calls to foreign customers in the languages of their countries. Assistance is also given in connection with the deciphering of addresses, telephone numbers, telegraphic addresses, and letter headings of foreign correspondents.

Materials Handling Conference

The Institute of Materials Handling will hold their second international conference at the Prince of Wales Hotel, Southport, Lancs., from May 10 to 12. There will be plenary sessions concerned with handling problems in the can-making industry, in motor-vehicle manufacture, and in precision engineering, for example. In addition, many works visits have been arranged.

Full details of the programme are obtainable from the Secretary, Mr. H. M. C. Harwood, O.B.E., 32 Watling Street, London, E.C.4.

New Companies Registered*

DONNETT MACHINE TOOLS, LTD., 9 Eaton Road, Coventry. Registered January 24, 1961. Nom. cap.: £100 in £1 shares. Directors: F. G. E. Bennett and Wm. J. Lindon.

NEWCASTLE PRECISION ENGINEERS, LTD., 5 St. Mary's Place, Newcastle-on-Tyne, 1. Registered January 25, 1961. Nom. cap.: £2,000 in £1 shares. Directors: G. V. Carr and E. Carr.

L.K. TOOL CO., LTD., Chevin Close, Broadway, Duffield, Derby. Registered January 30, 1961.Nom. cap.: £10,000 in £1 shares. Directors: J. Lowther, and J. A. Lowther, N. Key and M. C. Key.

PARKFIELD FOUNDRIES (TEES-SIDE), LTD. Registered January 24, 1961. Nom. cap.: £100,000 in £1 shares. Subscribers: G. B. Taylor, 81 Junction Road, Norton, Stockton-on-Tees, and F. W. Urwin, 22 High Street, Stockton-on-Tees.

H. A. LAWRENCE, LTD. Registered January 30, 1961. To carry on the business of precision engineers, etc. Nom. cap.: £10,000 in £1 shares. Directors: H. A. Lawrence, 5, Westfield Avenue, Brockworth, Glos., and Mrs. J. Foster, "Halloughton," Nether Whitacre, Nr. Coleshill, Birmingham.

EX-CELL-O CORPORATION, LTD., particulars filed January 31, 1961. British address: 3 Noble Corner, Gt. West Road, Hounslow, Middlesex. Registered in State of Michigan, U.S.A., in July, 1919, to carry on the business of a "general manufacturing business and machine workers," etc. Capital: 5,000,000 shares of $3 each. Name of person authorised to accept service: Wm. T. Gibbs, 3 Noble Corner, Great West Road, Hounslow, Middlesex.

*From the lists compiled by Jordan & Sons, Ltd., Company Registration Agents, 116-118 Chancery Lane, London, W.C.2.

Scrap Metals

†LONDON.—‡Prices per ton for non-ferrous scrap metals free from iron are as follows:—Clean copper wire, untinned and free from lead and solder, £187; clean heavy copper, untinned and free from lead and solder, £181; copper wire No. 2, £175; clean light copper, £171; braziery copper, £163; gunmetal, £167; brass, mixed, £118; lead, net, £50; zinc, £41; cast aluminium, £97; old rolled aluminium, £100; battery lead, £24; unsweated brass radiators, £95; hollow pewter, £535; black pewter, £410.

MIDLANDS.—Most merchants find that supplies of non-ferrous scrap are rather limited at present because trade generally is slow particularly in the motor car works, with consequent adverse effects on the demand for zinc die castings and brass fittings. An early improvement in this respect does not seem likely. The following notes give a general idea of market conditions for certain types of scrap.

Copper.—Following weakness which has been apparent recently there are now hopes of better prices although the situation must be viewed with a certain amount of caution. The demand for braziery copper is not so keen, and prices have fallen by £5 to £8 per ton.

Brass.—Demand for mixed brass is fairly strong, from ingot makers. There is, however, a tendency for the higher grades to ease and this applies especially to rod swarf, which commands a price only slightly better than that of mixed scrap.

Gunmetal.—Demand is good and prices have shown little change over the past few weeks.

Lead.—Prices have shown very little alteration for some time and only emphasise the depressed state of the market. No improvement can be visualised in the near future.

Aluminium.—Although there appears to have been a slightly higher demand during the past week, which has resulted in a slight increase in prices, the market is still very weak. All grades are affected, and very little interest is shown in old rolled scrap and swarf. Merchants may find it advisable to hold material, where space permits, until prices show some change for the better.

White Metals.—With very little change in the tin market, solder and pewter prices have remained constant.

† George Cohen, Sons & Co., Ltd., 600 Wood Lane, London, W.12.
‡ Subject to market fluctuations.

Machine Tool Share Market

Stock markets displayed a firm tone during the period under review, and fairly active conditions prevailed in most sections. Interest was centred mainly in industrial ordinary shares which improved as a result of well spread investment and speculative demand. While there was some irregularity in price movements, changes on balance were mainly to higher levels and numerous features were in evidence as a result of " take over " situations.

Quiet conditions persisted in the gilt-edged section. Undated British Government stocks suffered some setbacks, but short dated and kindred issues finished with a general improvement.

Among machine tool issues, Asquith Machine Tool advanced 1s. 6d. to 11s. 6d.; Birmingham Small Arms, 2s. to 31s.; Brooke Tool, 6d. to 6s. 10½d.; Broom & Wade, 1s. 6d. to 23s. 9d.; Chas. Churchill, 3d. to 8s. 4½d.; Coventry Gauge & Tool, 1s. 9d. to 26s. 3d.; Newall Engineering, 6d. to 7s. 6d.; Noble & Lund, 6d. to 5s. 6d.; F. Pratt, 3d. to 15s.; John Shaw & Sons (Wolverhampton), 6d. to 16s. 9d.; and Stedall & Co., 1s. to 8s. 9d. On the other hand, Edgar Allen lost 3d. at 38s.; and John Harper, 3d. at 8s.

TAP AND DIE CORPORATION, LTD.—Interim dividend 7½ per cent.

NOBLE & LUND, LTD.—Final dividend 8 per cent, making, with the interim, a total distribution of 13 per cent for the year 1960. This was an increase of 2 per cent on the total payment for the previous year.

New Appointments

The following appointments have been announced:—

MR. C. E. MIDDLEMISS, B.Com., as general manager of Associated British Machine Tool Makers, Ltd., 17 Grosvenor Gardens, London, S.W.1. He succeeds Mr. M. Stipelman, B.Sc., M.I.Mech.E., who retired on December 31.

MR. A. G. CLEGHORN, general works manager, Blackheath Works, Birmingham, and MR. W. H. WENTWORTH PING, general sales manager, Sheffield, as special directors of Firth-Vickers Stainless Steels, Ltd., Staybrite Works, Weedon Street, Sheffield 9.

MR JAMES WINSTANLEY, M.A., A.M.I.Loco.E., as general overseas manufacturing manager of F. Perkins, Ltd., Peterborough. He will be responsible to Mr. K. E. Woollatt, director of the overseas manufacturing division. Mr. Winstanley joins the organization from J. Stone & Co. (Deptford), Ltd., where he was assistant to the managing director and assistant manager of the contracts department.

COMPANY		Denom.	Middle Price
Abwood Machine Tools, Ltd.	Ord.	1/-	1/3xd
Allen (Edgar) & Co., Ltd.	Ord.	£1	38/-
" " "	5% Prf.	£1	14/-*
Arnott & Harrison, Ltd.	Ord.	4/-	13/3
Asquith Machine Tool Corp., Ltd.	Ord.	5/-	11/6xd
" " "	6% Cum. Prf.	£1	18/9
Birmingham Small Arms Co., Ltd.	Ord.	10/-	31/- ex capt.
" " "	5% Cum. "A" Prf.	£1	14/6
" " "	6% Cum. "B" Prf.	£1	16/6
" " "	4% 1st Mort. Deb.	Stk.	90½
British Oxygen Co., Ltd.	Ord.	5/-	27/6
" " "	6% Cum. Prf.	£1	20/-
Brooke Tool Manufacturing Co., Ltd.	Ord.	5 -	6/10½
Broom & Wade, Ltd.	Ord.	5/-	23/9
" "	6% Cum. Prf.	£1	17/-
Brown (David) Corporation, Ltd.	5½% Cum. Prf.	£1	16/-
Buck & Hickman, Ltd.	6% Cum. Prf.	£1	17/-
Butler Machine Tool Co., Ltd.	Ord.	5 -	17/6
" " "	5% Cum. Prf.	£1	14/3
Churchill (Charles) & Co., Ltd.	Ord.	2/-	8/4½
" " "	6% Cum. Prf.	£1	25/9‡
Churchill Machine Tool Co., Ltd.	Ord.	5/-	39/6
" " "	6% Cum. Prf.	£1	17/6
Clarkson (Engrs.), Ltd.	Ord.	5/-	27/6
Cohen (George), 600 Group, Ltd.	Ord.	5/-	12/6
" " "	4½% Cum. Prf.	£1	13/-
Coventry Gauge & Tool Co., Ltd.	Ord.	10/-	26/3 ex rights
" " "	5% Cum. Red. Prf.	£1	16/3
Craven Bros. (Manchester), Ltd.	Ord.	5/-	10/9
Elliott (B.) & Co., Ltd.	Ord.	1/-	3/1½xd
" "	4½% Red. Cum. Prf.	£1	13/-
Expert Tool & Case Hardening Co., Ltd.	Ord.	2/-	2/-
Firth Brown Tools, Ltd.	4% Cum. Prf.	£1	11/-
Greenwood & Batley, Ltd.	Ord.	10/-	25/9
Harper (John) & Co., Ltd.	Ord.	5/-	8/-
" "	4½% Red. Cum. Prf.	£1	12/3
Herbert (Alfred), Ltd.	Ord.	£1	60/-
Holroyd (John) & Co., Ltd.	"A" Ord.	5/-	16/3
" " "	"B" Ord.	5/-	15/-
Jones (A. A.) & Shipman, Ltd.	Ord.	5/-	31/3
" " "	7% Cum. Prf.	5/-	5/-
Kearney & Trecker-C.V.A., Ltd.	5½% Red. Cum. Prf.	£1	11/-
" " "	Prefd. Ord.	£1	13/9
Kearns (H. W.) & Co., Ltd.	Ord.	5/-	18/9
Kerry's (Gt. Britain), Ltd.	Ord.	5/-	10/-
Macreadys Metal Co., Ltd.	Ord.	5/-	15/-
Martin Bros. (Machinery), Ltd.	Ord.	2/-	2/-
Massey (B. & S.), Ltd.	Ord.	5/-	10/-
Newall Engineering Co., Ltd.	Ord.	2/-	7/6
Newman Industries, Ltd.	Ord.	2/-	5/3
" "	6% Prf. Ord.	5/-	5/-
Noble & Lund, Ltd.	Ord.	2/-	5/6
Norton, W. E. (Holdings), Ltd.	Ord.	2/-	3/3
Osborn (Samuel) & Co., Ltd.	Ord.	5/-	43/6
" " "	5½% Cum. Prf.	£1	25/-
Pratt (F.) & Co., Ltd.	Ord.	5/-	15/-
Sanderson Kayser, Ltd.	Ord.	10/-	34/4½
" " "	6½% Cum. Prf.	£1	18/-
Scottish Machine Tool Corporation Ltd.	Ord.	4/-	10/-
Shardlow (Ambrose) & Co., Ltd.	Ord.	£1	45/-
Shaw (John) & Sons, Wolverhampton, Ltd.	Ord.	5/-	16/9
Sheffield Twist Drill & Steel Co., Ltd.	Ord.	4/-	16/-
" " " "	5% Cum. Prf.	£1	14/3
Stedall & Co., Ltd.	Ord.	5/-	8/9
Sykes (W. E.), Ltd.	"B" non-voting Ord.	10/-	24/-
Tap & Die Corporation, Ltd.	Ord.	5/-	14/9
" " "	4½% Deb. 1961-1977	Stk.	84½
Wadkin, Ltd.	Ord.	10/-	20/-
Ward (Thos. W.), Ltd.	Ord.	£1	64/6
" "	5% Cum. 1st Pref.	£1	14/-
" "	5% Cum. 2nd Pref.	£1	22/-
Willson Lathes, Ltd.	Ord.	1/-	3/4½

The Middle Prices given in the list are in several cases nominal prices only and not actual dealing prices. Every effort is made to ensure accuracy, but no liability can be accepted for any error. * Sheffield price. ‡ Birmingham price.

PRICES OF MATERIALS

All prices per ton except where otherwise stated.

Pig Iron

Foundry and Forge No. 3, Class 2

Middlesbrough (10 tons or over)	£21 17 0
Birmingham (10 tons or over)	£21 9 3

Phos. Over 0·1 up to 0·4%

Birmingham (6 ton lots)	£23 5 0
Grangemouth (6 ton lots)	£23 10 0

Hæmatite

English No. 1 (10 tons or over)	
N.E. Coast (made in N.E.)	£23 19 0
Scotland	£24 5 6
Sheffield	£25 9 0
Birmingham	£25 13 0
Welsh 10 tons or over	£23 19 0

Steel Products

Medium plates (50 tons andover)	£43 16 6
Mild steel plates, ordinary (50 tons and over)	£40 7 0
Boiler plates (50 tons and over)	£42 17 0
Flat bars, 5 in. wide and under (50 tons or over)	£39 1 0
Round bars, under 3 in. (50 tons or over)	£39 1 0
Billets, rolling quality, soft U.T. (100 tons or over)	£31 15 6

Phosphor Bronze

Ingots (288) (A.I.D. d/d	£305 0 0

Copper

Cash (mean)	£220 17 6
Cold rolled and hot rolled sheets 4 ft. by 2 ft. by 10 SWG	£296 15 0—297 0 0
Rods, $\frac{7}{16}$ in. to $\frac{1}{2}$ in. diam.	£313 0 0
Tubes, $1\frac{1}{4}$ in. bore by 10 SWG, ton lots, per lb.	3s. 0½d.
Wire rod, black, hot-rolled ($\frac{1}{4}$–$\frac{7}{16}$ in.), English	£236 7 6

Zinc

Refined, minimum 98 per cent purity, current month (mean)	£82 12 6

Brass

Tubes, solid drawn, per lb.	1s. 9d.
Strip 63/37, 6in. by 10 SWG coils, ton lots	£251 15 0—£254 15 0
Rods, $\frac{1}{2}$-3 in. diam. (59 per cent copper)	2s. 0d.

Yellow Metal

Condenser plates, per ton	£179 0 0
Rods, per lb.	2s. 1d.

Aluminium

Ingots, min. 99·5 per cent	
Canadian d/d	£186 0 0

Tinplates

*U.K. Home trade: Cold reduced, f.o.r. makers works (15-50 tons)	£3 6 8
U.K. Export: Hot rolled basis, f.o.r. works port	73s. 6d.—76s. 0d.
Cold reduced basis, f.o.r. works port	73s. 6d.—76s. 0d.

Gunmetal

Ingots, B.S. 1400 L.G.2, delivered	£215 0 0

* Official maximum price, after allowing for adjustments for increase in price of tin.

MAKERS' PRICES

Hexagon Steel Bars[1]

Sizes in inches from 1 in. up to 2·21 and 2·41 a/f ex works, 2 ton basis	£42 17 0
Free cutting black	£47 6 6

Reeled Steel Bars[1]

Single-reeled, 1½ in. upwards, f.o.t. works (+ usual extra for sizes)	£43 9 6
Free cutting	£47 19 0

Precision-ground Mild Steel[2]

1-in. diam. + 0·00025-in. 4-ton lots, per cwt.	121s. 6d.

Bright Ground Stainless Steel Bars[3]

EN56AM (martensitic, free cutting)	£304 10 0
EN58AM (austenitic free cutting)	£377 10 0

Prices are basic, subject to extras

High-speed Steel

Black random length bar. All prices basic, per lb., subject to extras:

Molybdenum "66"	6s. 5d.
Molybdenum "46"	6s. 3d.
14 per cent tungsten	6s. 11d.
16 per cent tungsten	7s. 4d.
18 per cent tungsten	7s. 9d.
22 per cent tungsten	9s. 2d.
5 per cent cobalt	10s. 10d.
4·75/5·25 molybdenum + 6·0/6·75 tungsten + 1·75/2·05 vanadium per cent (5-6-2)	6s. 7d.

Precision-ground, High-speed Free-turning Brass Rod[3]

½-in. diam. ±0·00025-in., 2 ton lots, per lb.	2s. 9½d.

Grey Iron Rod

Die Cast[4] in random lengths 18 in. to 26 in. rough machined $\frac{1}{16}$-in. above listed size. Extra for definite lengths. Discounts for orders over £150.

	Per cwt. net. Mark I	Mark III
¾ or ⅞ in.	260s. 3d.	338s. 3d.
1 or 1¼ in.	208s. 4d.	267s. 3d.
1½ to 1¾ in.	146s. 3d.	181s. 7d.
1⅞ to 2 in.	112s. 7d.	133s. 6d.
2¼ to 3½ in.	97s. 1d.	112s. 9d.
3¾ to 12 in.	91s. 9d.	105s. 3d.

Continuous Cast

10-ft. lengths, centreless machined 1 to 3-in. diam. + 0·010 to 0·020 in., prices as quoted for die cast bar[4]		
centreless ground 1 or 1¼ in.		202s. 3d.†
+0·010 in. Extra for hardenable alloy iron[5]	1¼ to 1½ in.	142s. 0d.†
	1⅝in. to 2 in.	109s. 4d.†
Per cwt. net	2¼ to 3½ in.	94s. 3d.†

† All prices+3 per cent.

Stellite[6]

Welding Rods, plain

¼ in. diam., per lb.	30s. 0d.

Toolbits

½ in. sq. × 4 in., each	22s. 3d.

1 Colvilles, Ltd., Glasgow, and 17 Grosvenor Street, London, W.1. 2 Pratt, Lovick & Co., Ltd., Chester. 3 Spartan Steel & Alloys, Ltd., St. Stephens Street, Birmingham, 6. 4 Sheepbridge Alloy Castings, Ltd., Sutton-in-Ashfield. 5 "Flocast," Harold Andrews Sheepbridge, Ltd., Halesowen. 6 Deloro Stellite, Ltd., Highlands Road, Shirley, Solihull.

BASIC PRICES FROM LONDON STOCK[1]

Free Cutting Steel

Bright cold drawn: (Usaspead) over 1 to 2 in.	£59 4 6
Lead bearing (Usaled)	£63 11 0
Precision ground, 1½ in.	£84 14 6

Bright Drawn

M.S. bars (M.M.C.) over 1½ to 2 in.	£56 10 0
Square edge flats (Usaflat)	£73 6 6
M.S. angles (Usaspead)	£100 6 6
Case hardening (EN) (Usacase) over 1½ to 2 in.	£62 10 0
M.S. bars (EN3B) (Usamild) over 1½ to 2 in.	£58 16 6
Carbon manganese semi-free cutting case hardening (EN202) (Usaspead 202) over 1½ to 2 in.	£71 5 0
35/45 ton tensile (EN6) (Usen) over 1 to 1½ in.	£67 3 0
0·4 carbon normalized (Usaspead "40") over 1½ to 2 in.	£69 5 0
0·45 carbon normalized EN9 (Usaspead 55)	£69 15 0
Carbon manganese steel to Specification EN16T (Usaspead 5565), per ton	£126 17 0

Ground Flat Stock

18-, 24-, and 36-in. lengths (Usaspead). List prices plus 10 per cent, less 5 per cent.

Oil Hardening Cast Steel

Non-shrink (Usaspead N.S.O.H.) ¾ in. to 2½ in., per lb.	1s. 11d.
Non-distorting heavy duty (Usaspead H.C.H.C.), ¾ in. to 2½ in., per lb.	4s. 2d.

Silver Steel

(0·194-in. to 1½-in.)

Genuine Stubs quality, per lb.	9s. 10d. less 27½%
M.M.C. quality, per lb.	2s. 8d. + 6½%
Boxes of 16 assorted sizes, $\frac{7}{16}$ in. to ⅞ in. diam.	7s. 6d.

Stainless Steel

KE40AM (free cutting), per lb.	3s. 8d.

Glacier Machined Bronze Bars

Phosphor bronze (288) / Lead bronze	Prices on application

High-speed Steel

18 per cent tungsten. Prices on application.

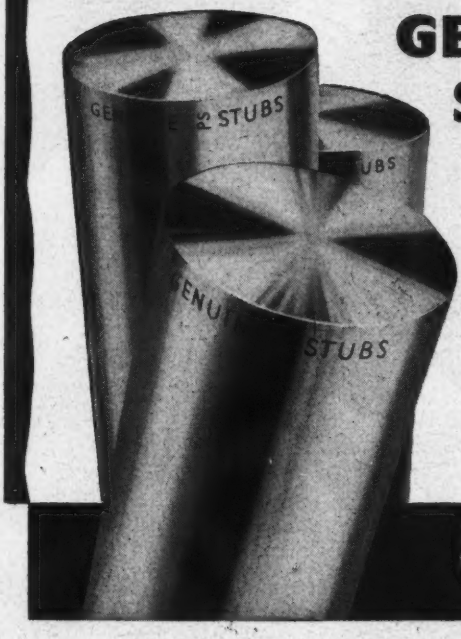
Toolholder bits:

Usaspead "Super" / "Supreme" / Cobalt 10	List price

Shimstock

Steel assorted, per tin	3s. 6d.
Brass " "	7s. 3d.

1 Macready's Metal Co., Ltd., Pentonville Road, N.1. Subject to confirmation by London Office. Delivered free by van in London area.



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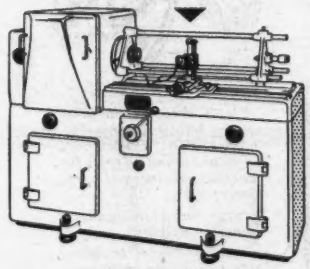
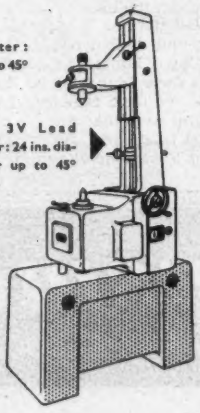
* No. 2H Lead Tester: Any helix angle. Standard 14 ins. diam. or 8 ins. diam. x 26 ins. long. Long Bed 10 ins. diam. or 8 ins. diam. x 54 ins. long.



* Can be arranged to test pitch.

No. 2V Lead Tester: 10 ins. diameter up to 45° helix.

No. 3V Lead Tester: 24 ins. diameter up to 45° helix.



The Lead Testers illustrated are only part of a wide range. Goulders can supply Gear Testing Instruments for *any* type of gear which can be instrument-mounted.

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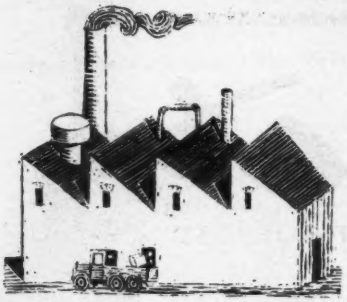

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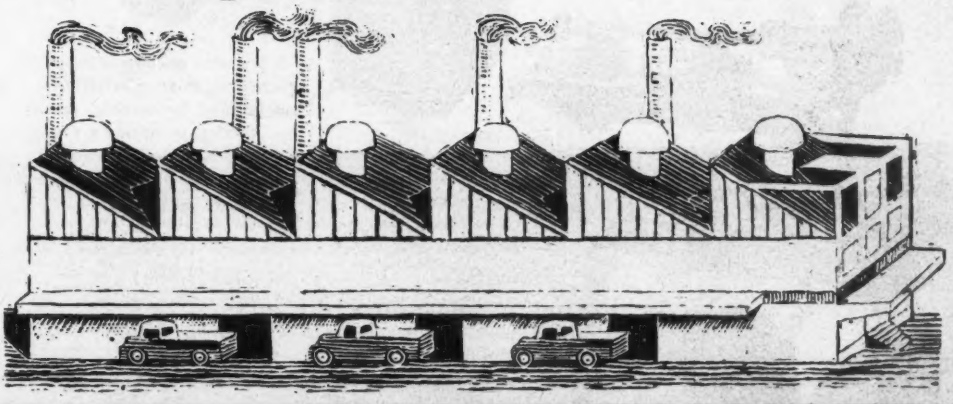

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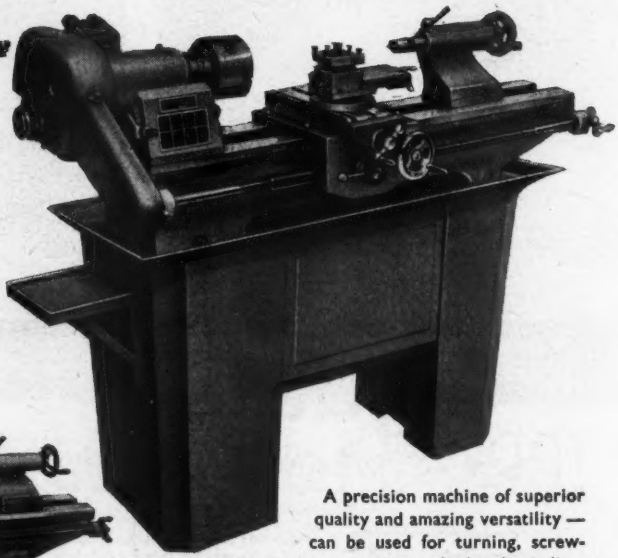
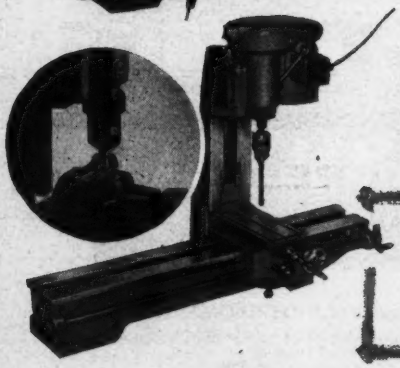
THE NEW AND OUTSTANDING MULTI-PURPOSE 10″ PRECISION LATHE

New—one machine that does the work of many with tool room standards of precision. Gives you maximum use from limited space in tool rooms, machine shops, training schools and industrial laboratories. Ideal for small production runs — converts in minutes from a bench lathe to a vertical miller, drill or jig borer.





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Height of centres	5″	Headstock quill feed ...	1 9/16″
Admits between centres ...	24″	Tailstock spindle travel ...	3¼″
Spindle bore	9/16″	Taper in spindle-tailstock	M.T. No. 2
Spindle speeds (7)	110-1700 r.p.m.		
Longitudinal feed per rev. ...	·0015″ and ·005″	Net weight	... 250 lb.
		Space required ...	48″ x 19″

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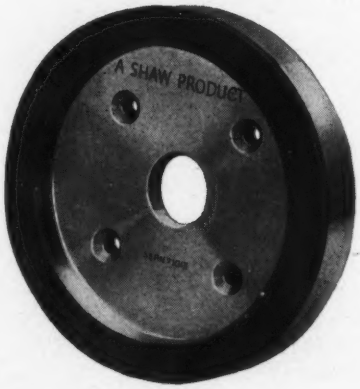

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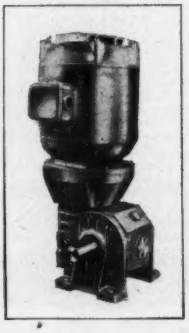
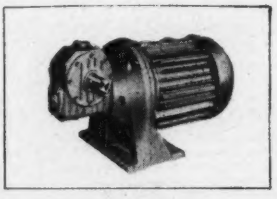
The Verso has all the famous features of Holroyd reliability and high efficiency. Centrifugally cast Holfos wormwheel; casehardened and profile ground alloy steel worm; ball bearings throughout; rigid cast iron casing and oil bath lubrication requiring no attention over long periods. Output speeds are from 14 to 300 rpm. Output torques up to 750 lb. ins Standard Motors from ¼ up to 2 hp.

Please write for catalogue V.60 which gives further technical information.





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For the following operations:—

- Delay in switching on high tension supplies
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- Auto-reset circuit breaker
- Motor-starting

ABRIDGED DATA			
Type	Delay at 20°C Min.	Max.	Heater Voltage
S.102/1G*	44	66	6·3
S.102/1K	44	66	6·3
S.103/1K	36	54	27
S.104/1K	25	35	6·3
S.105/1K	20	30	27
S.106/1K	44	66	19

* Flying Lead Version

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Standard or purpose designed Pneumatic size controls can be applied to all types of Grinding Machines

* Adjustable measuring range for ·001″ to ·008″ full scale.
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* Built-in facilities for timed gauging.
* Electrical circuits operate at mains voltage.
* 5 amp switch capacity—no external relays required.

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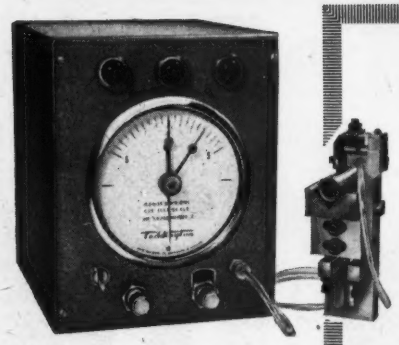

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Model 88/2 size controller with trend gauging head.

Adjustable for ¼″-1¼″ o.d. (or 1″-3″ o.d.) Tungsten Carbide wear surfaces.

Two control points, individually adjustable, for "Infeed" and "shut down".

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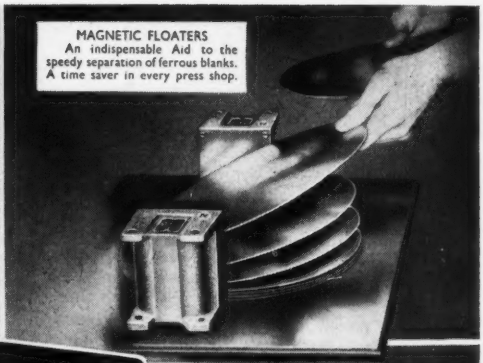

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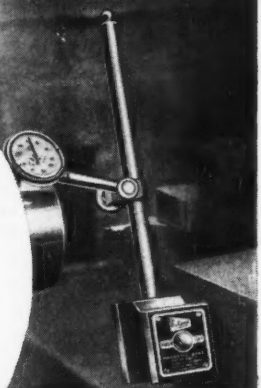

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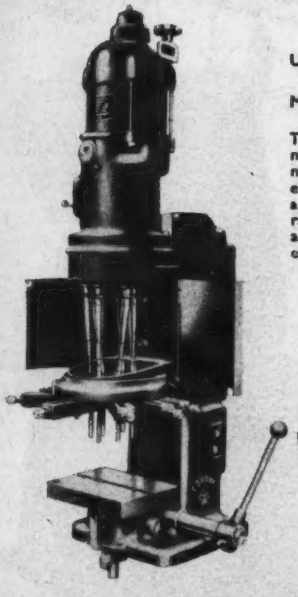

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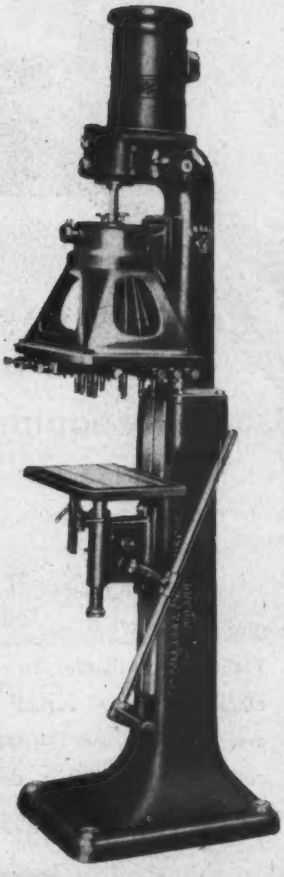

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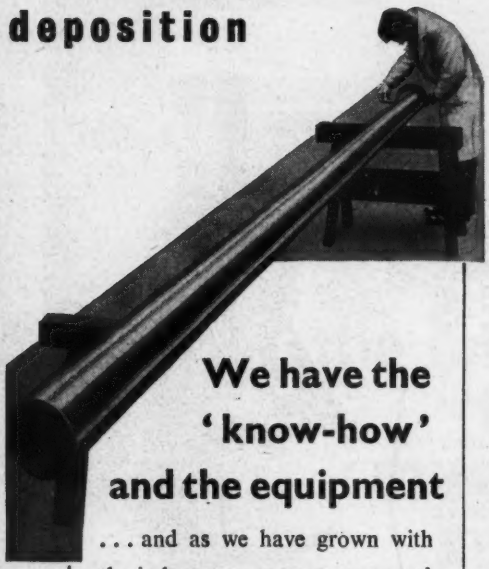

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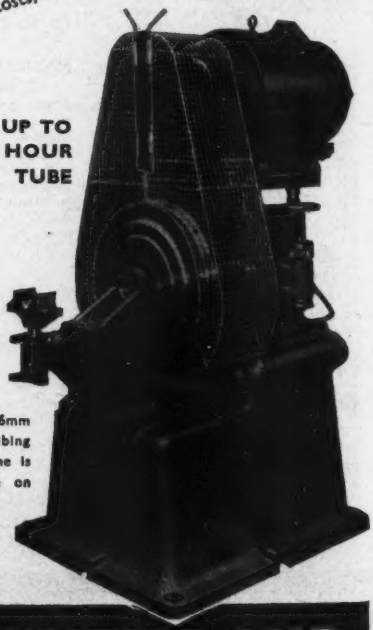

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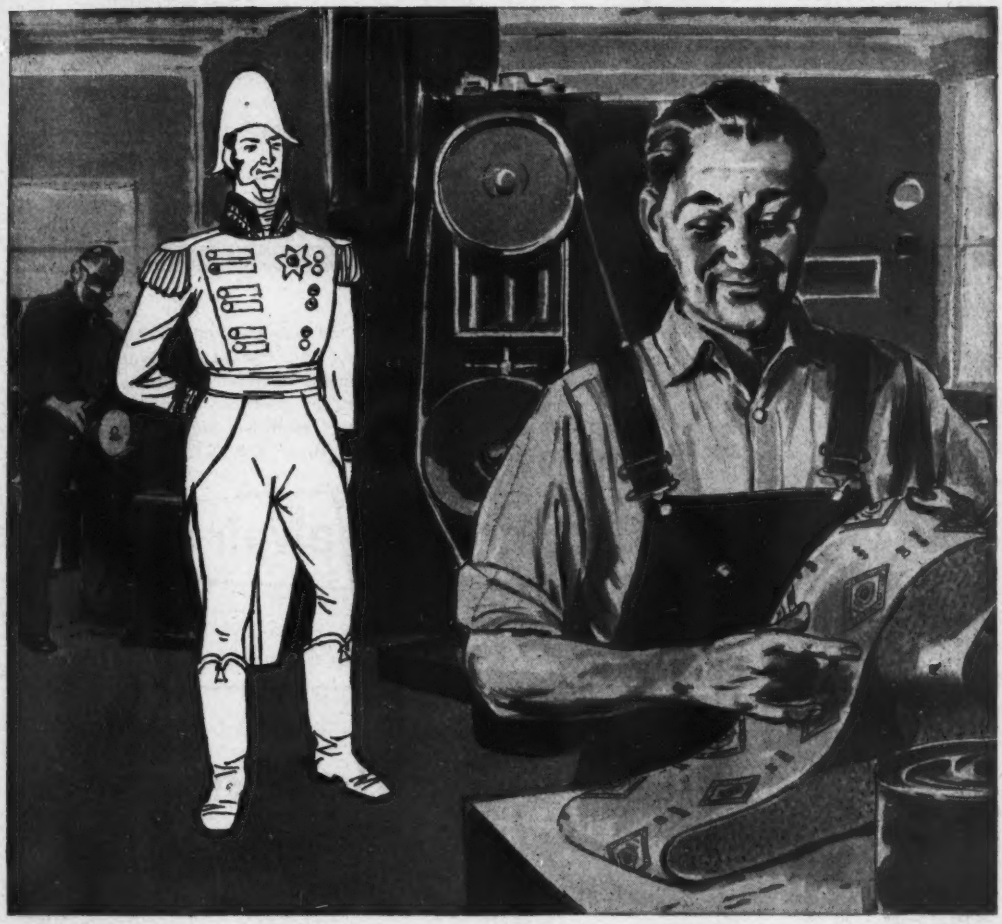

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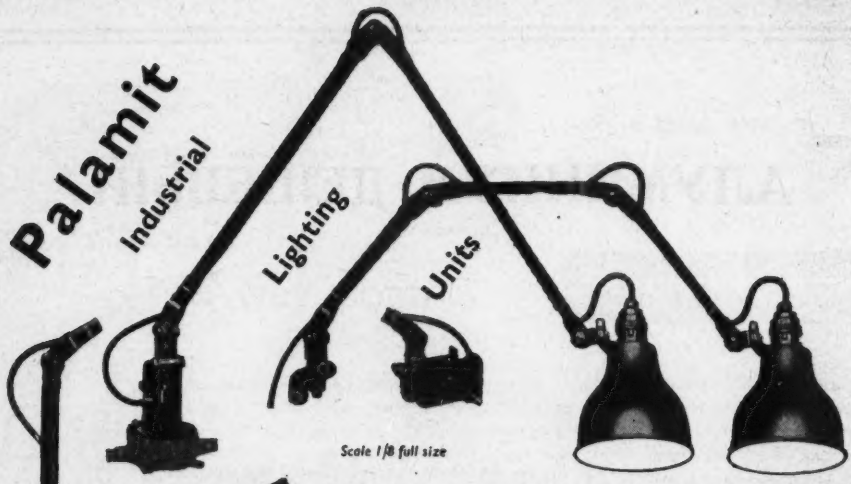

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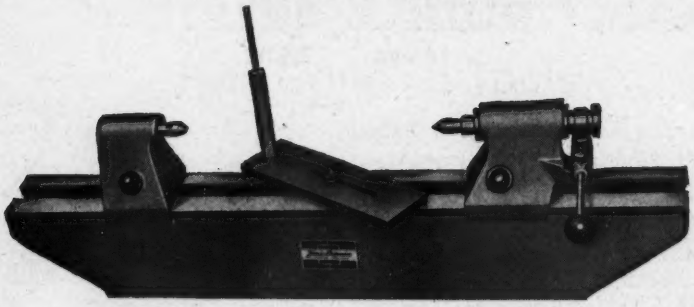

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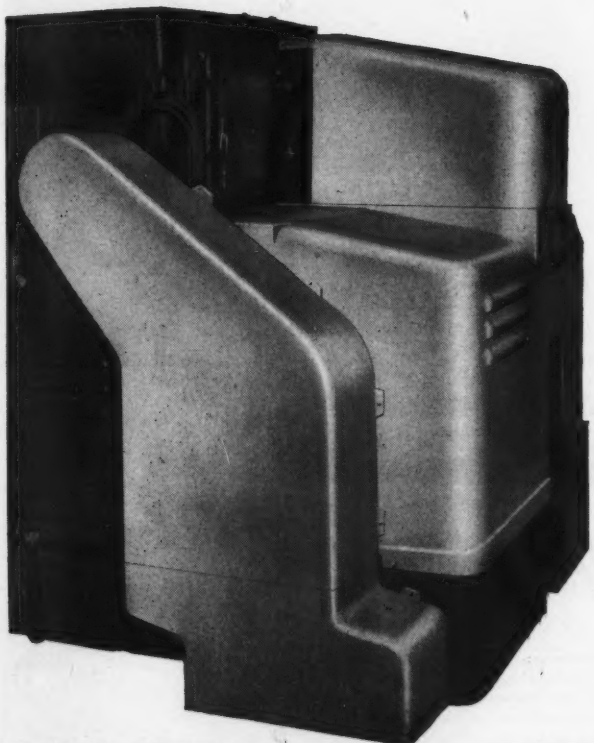

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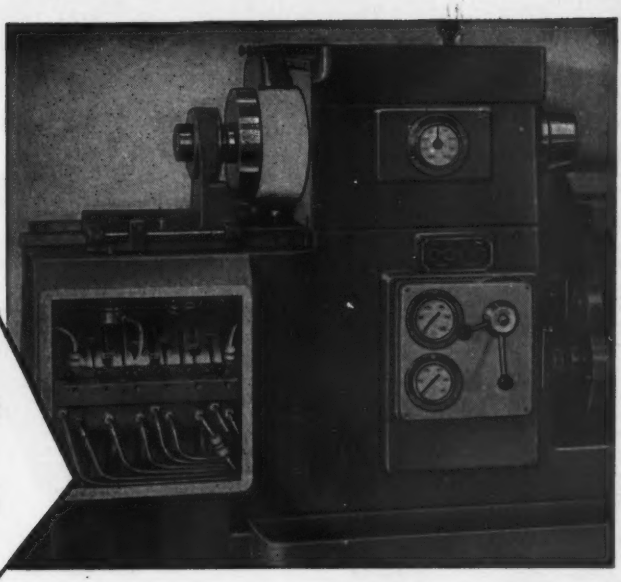

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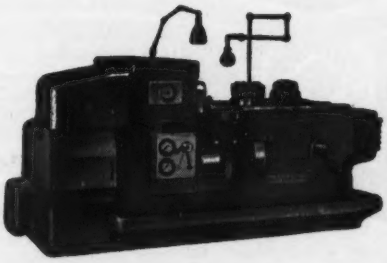

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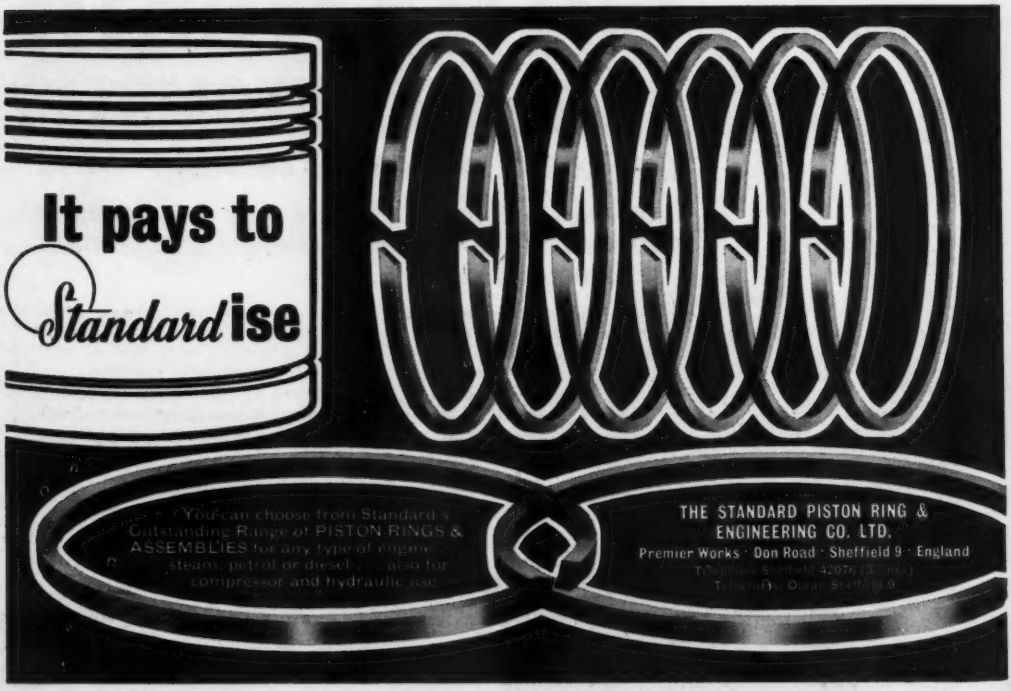
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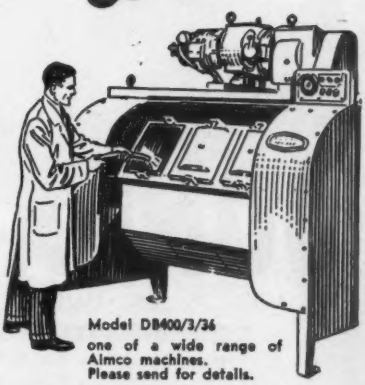

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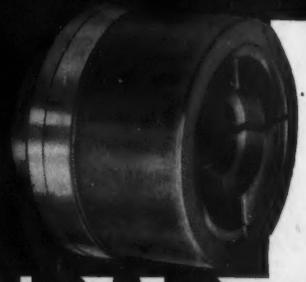

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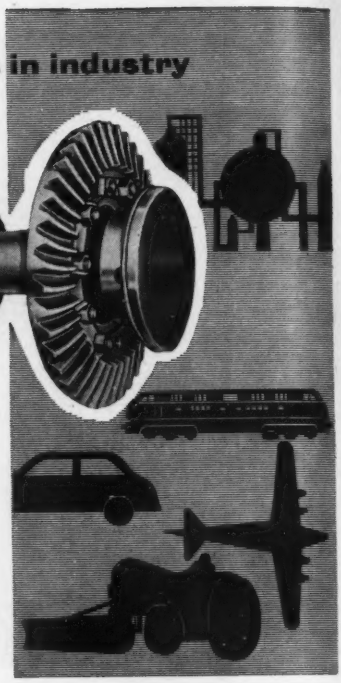

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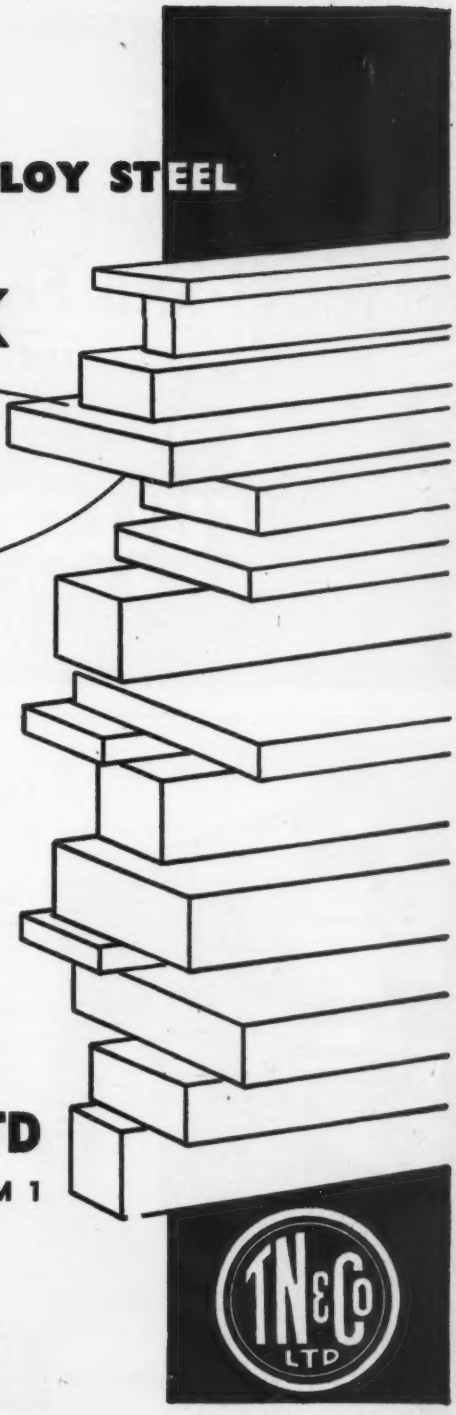

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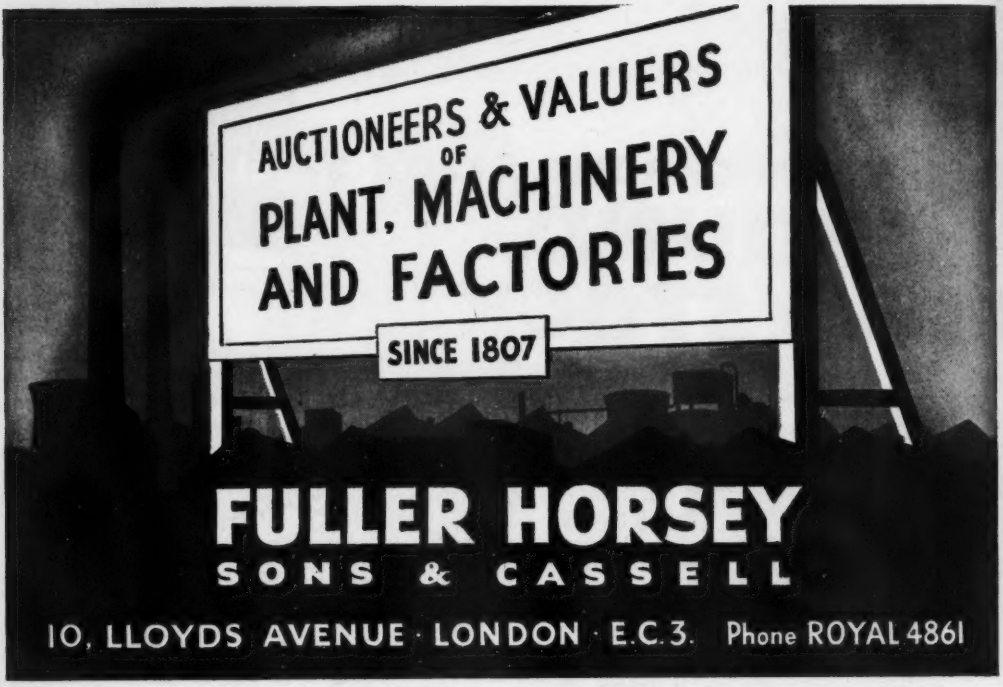

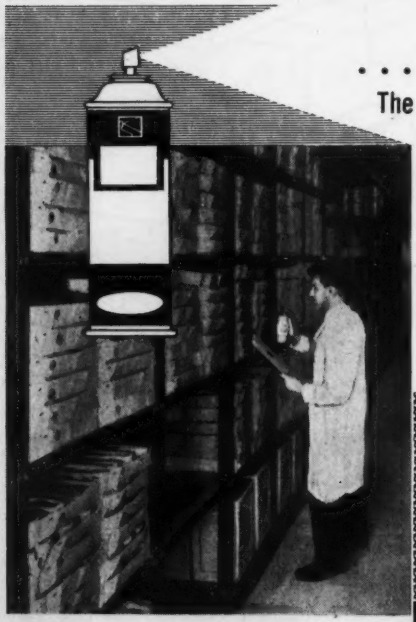

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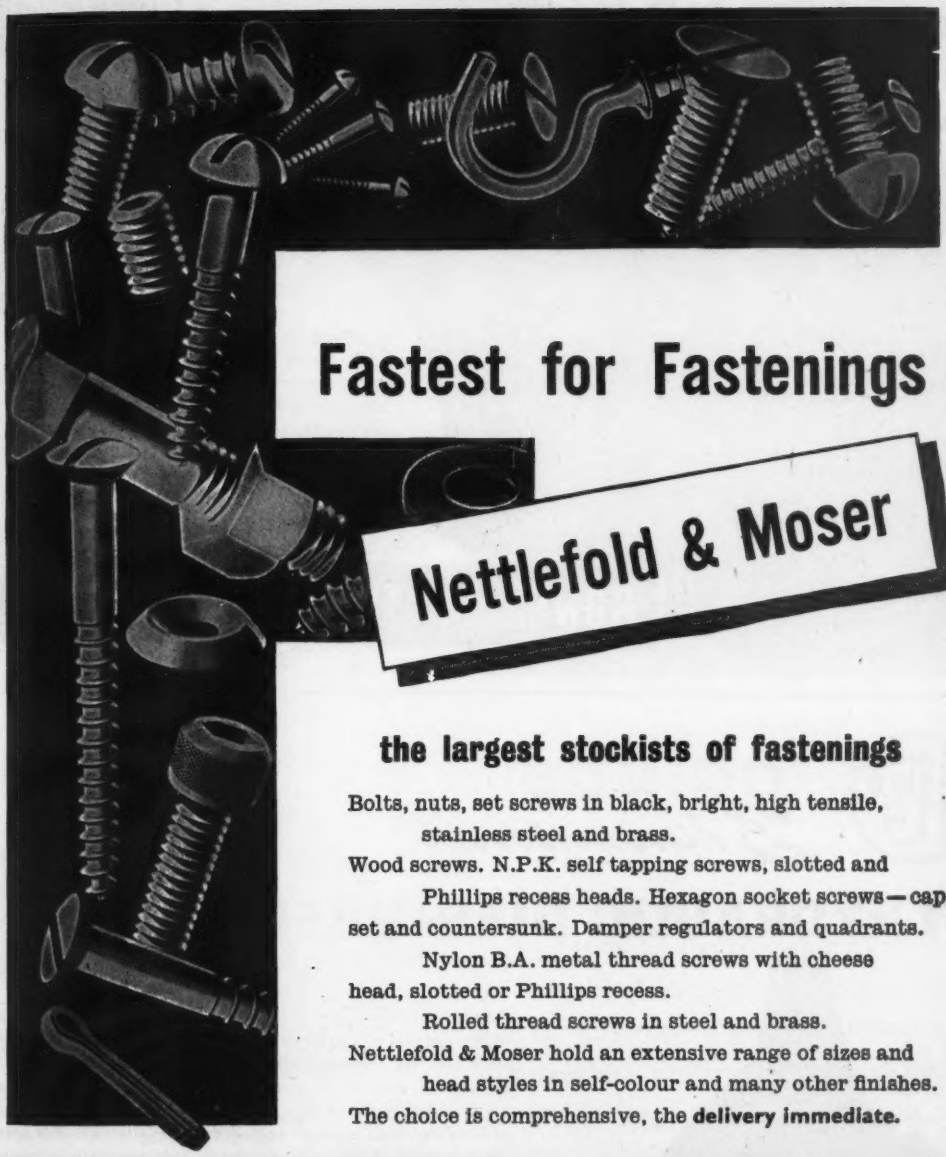

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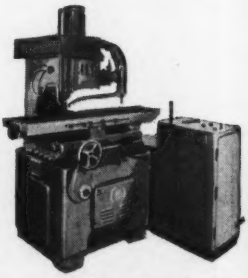

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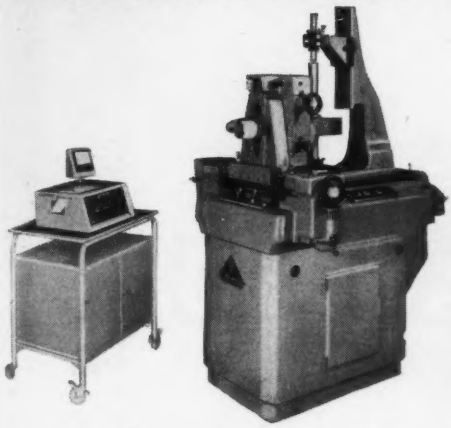

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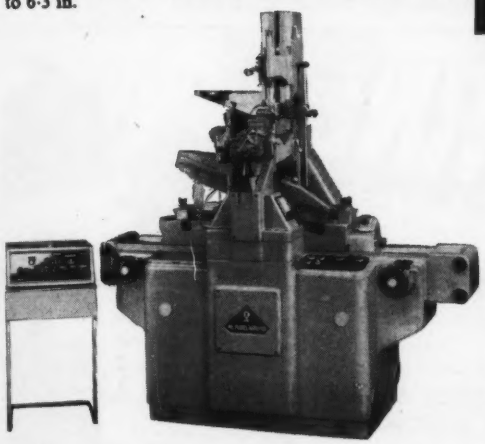

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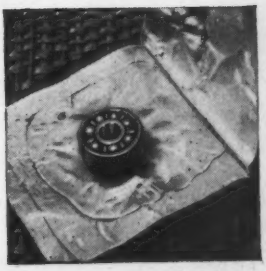

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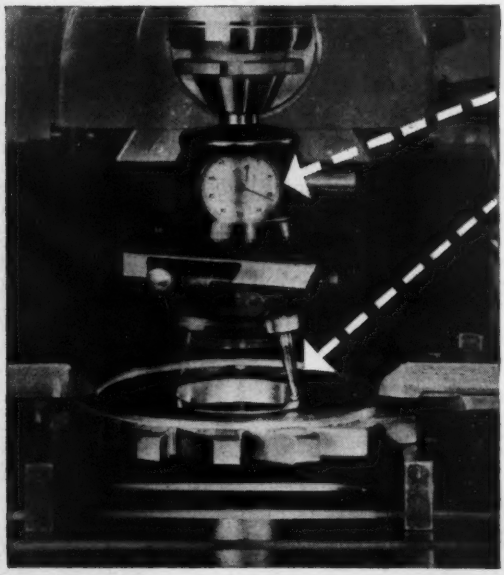

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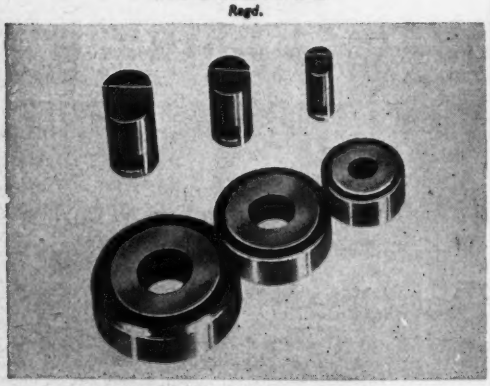

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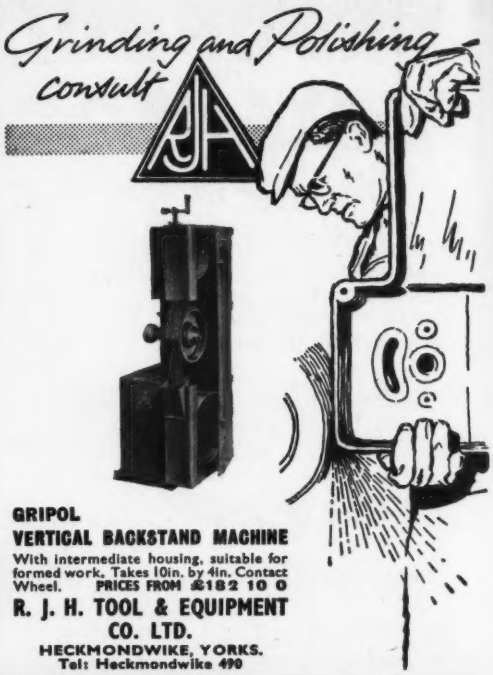

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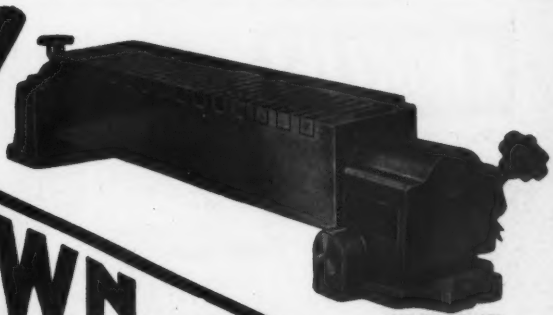

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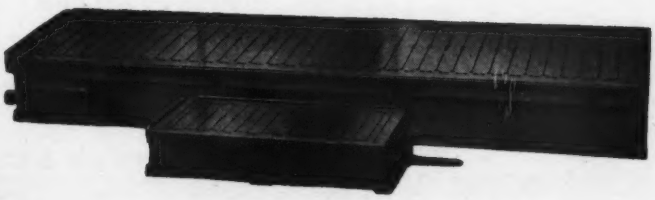

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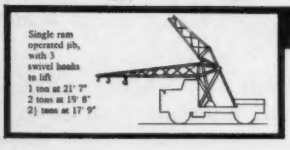

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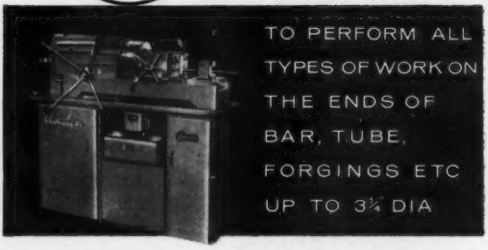

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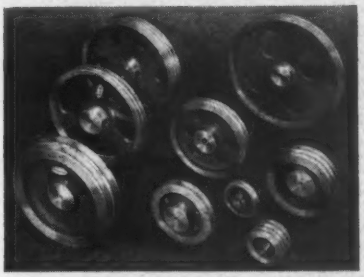

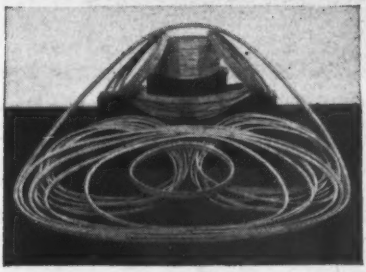

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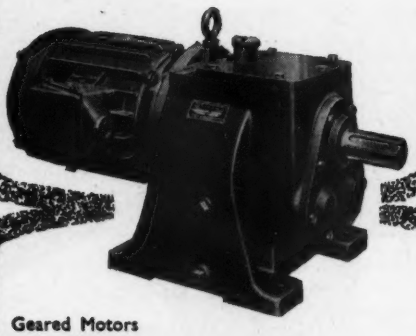

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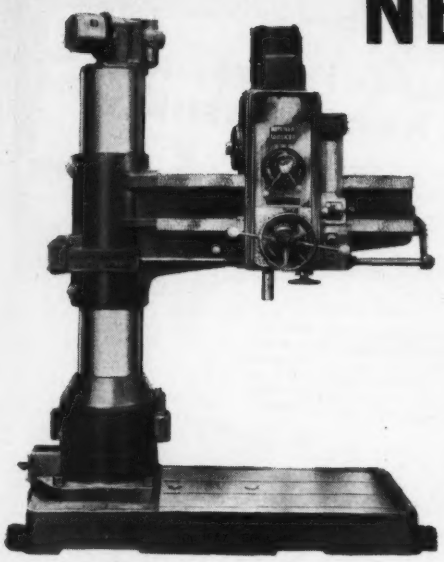

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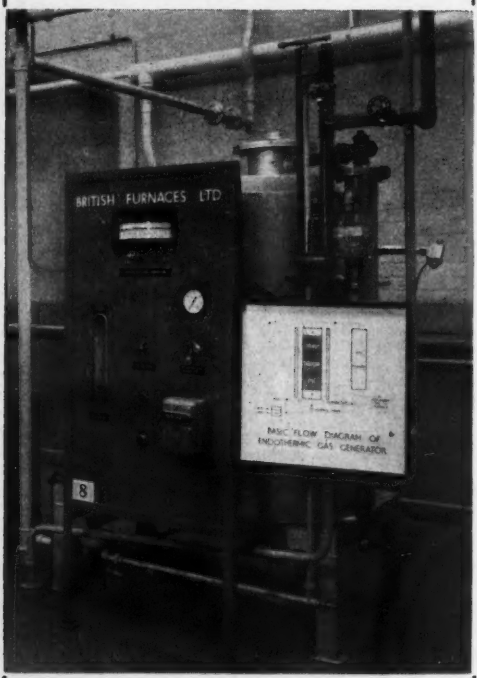

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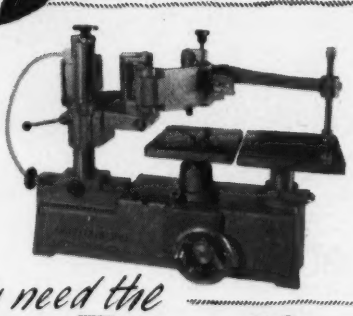

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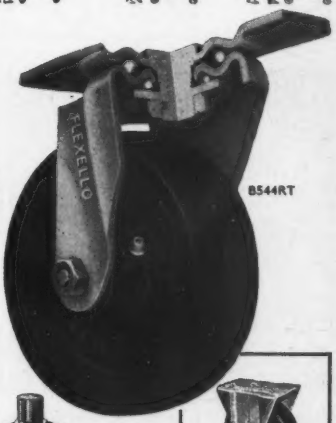

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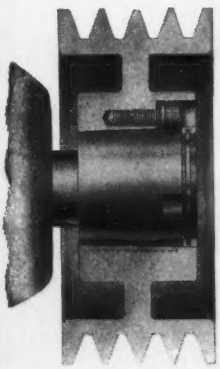

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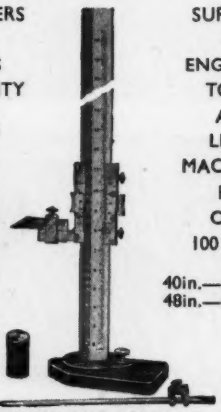

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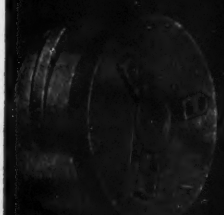

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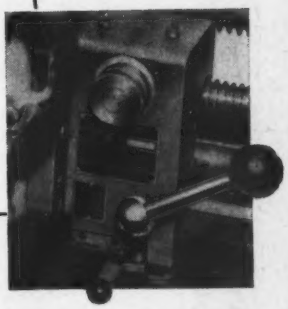

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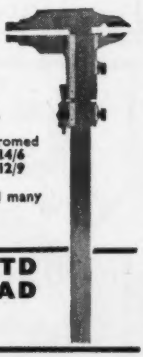

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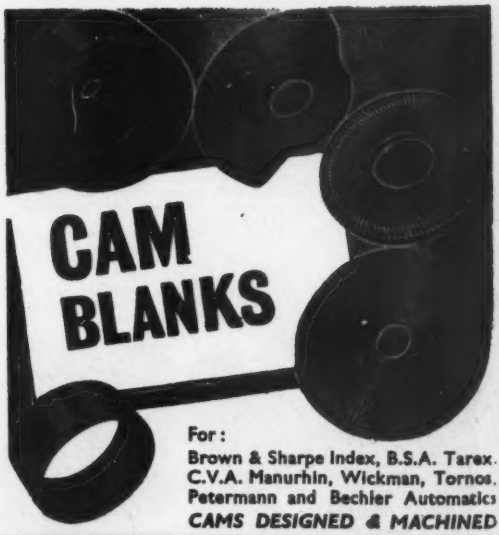

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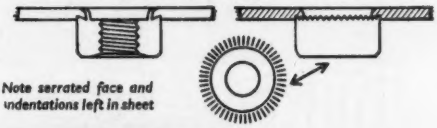

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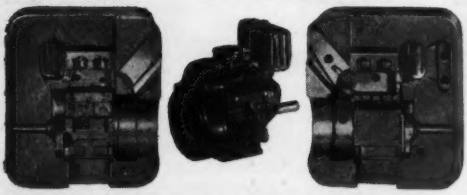

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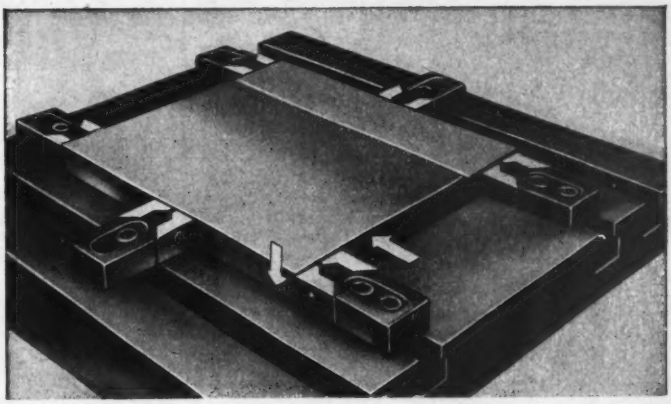

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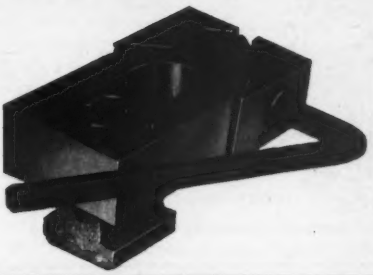

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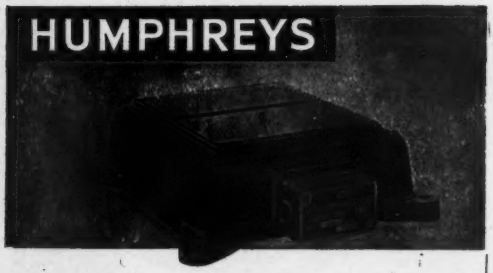

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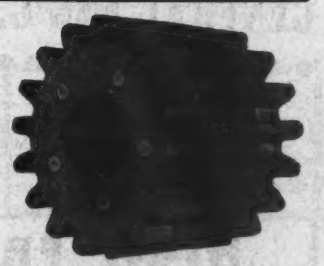

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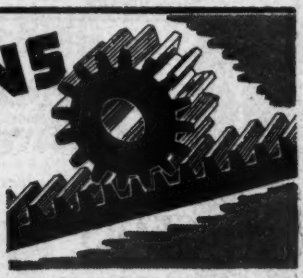

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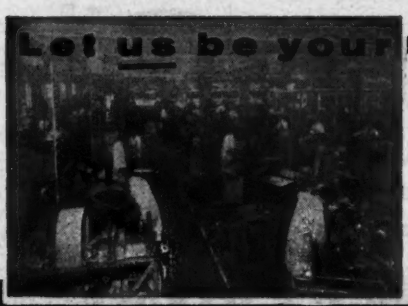

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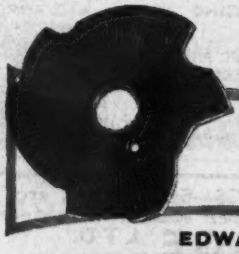

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D.S.G. 13Z Minor S.S. & S.C.
WILLSON 6½in. × 36in. Gap Bed S.S. & S.C.
PULTRA Model 10 Watchmakers' Lathe.

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WARD No. 7 (Curran Sub-Contract).
TAYLOR No. 1263 Capstan, ½in. cap.

DRILLS

GRIMSTON ELECTRISKA Mod. EB100 Bench.
CORONA Mod. 9FX Super High Speed Bench.
CORONA Model 12AX Bench, ½in. cap.
BRISDON Model 52 Pillar, ½in. cap.

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HERBERT JUNIOR Surface, 10in. × 6in. × 9in.
PRECIMAX UPH 10in. × 24in. Universal Hydraulic.
SCRIVENER No. 2 Centreless.
BROWN & SHARPE No. 5 Surface.
BROWN & SHARPE No. 23 Plain, cap. 10in. × 48in.
BROWN & SHARPE No. 2 Surface, cap. 6in. × 18in.
SMART & BROWN Internal, 1½in. cap.
BROWN & SHARPE No. 5, 3in. × 18in., Plain.
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NEWALL Model L.U. 10in. × 36in. Hyd. Universal.
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SNOW Mod. O.S.72 Surface, cap. 15in. × 72in.
CHURCHILL Mod. H.C.B. Internal Auto Size.
HAHN & KOLB Hyd. Disc Lapping M/c.
JACKMAN No. 22 Disc, 18in. dia.
LUMSDEN Mod. 12M Tool, 14in. × 2 wheel.

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REED PRENTICE Mod. 3VG, table 38in. × 10½in.
BEAVER V.B.A. Vert., table 40in. × 10in. NEW
DENBIGH No. C4. Swivel table 46in. × 10in.
CINCINNATI Mod. O8 Production.
KENDALL & GENT Duplex Profile, table 18in. × 15in.

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CENTEC No. 2A with vert. attachment.
BROWN & SHARPE No. 2 Universal, light type.
ADDOCK & SHIPLEY No. 1AB Plain, table 26in. × 7in.
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GISHOLT 4, 5 and 1L Turret Lathes, 1941-43
GRIDLEY Model R, 2½in. cap., 4 sp. Auto.
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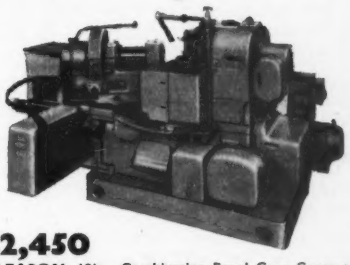

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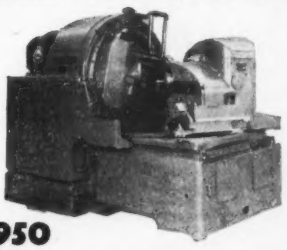

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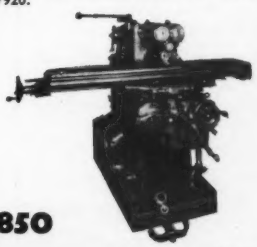

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ORMEROD 26in. Stroke Shaper; auto down feed.
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COLCHESTER STUDENT 6in. × 24in. Full equip.
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Spindle bore 3¼in.
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TATE

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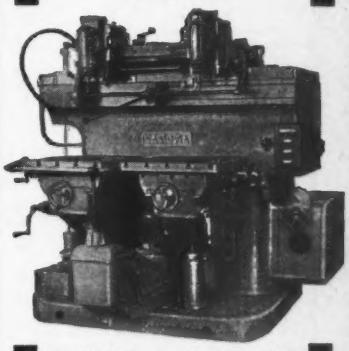

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14in. BUTLER High Production.
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VOA Jig Borer, 20in. × 15in. Table Movement.
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BROADBENT 12½in. Centre × 72in. b.c., swings 42in., 4¼in. hollow spindle, speeds 11-375, 12½ h.p. motor. Timken roller bearing headstock.
HERBERT No. 20 Comb., spindle bore 7in., speeds 5-201.
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Two **CLEVELAND** ⅞in. Model A Single Spindle Autos.
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CHURCHILL-REDMAN Gap Bed Surfacing and Boring Lathe, centre height 12in., distance spindle to turret 55in. Swing in gap 40in.
SWIFT Hydraulic Copying Lathe, 36in. swing × 5ft. 6in. b.c., 30 h.p. drive.

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ARCHDALE 28ip. Horizontal Miller.
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PENSOTTI PK90 Opensided Planer. Capacity 8ft. × 3ft. 6in. × 2ft. 6in. Complete with milling head.
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2D **HERBERT** Bar Feed Capstan Lathe.
2S. **HERBERT** Bar Feed Capstan Lathe.
2SS. **HERBERT** Bar Feed Capstan Lathe.
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4ft. **ASQUITH** Universal Drill. Portable.
6ft. × ¼in. **BENNIE** Guillotine. Heavy Duty.
8¼in. **LANG** S.S. & S.C. Lathe, 4ft. between centres.
36in. × 10in. **FRITZ WERNER** Plain Miller.
New 7in. **WOODHOUSE & MITCHELL** Type 70 Junior Lathe.
60in. **JACKSON & BRADWELL** Balancing Machine.
20in. **ARCHDALE** Plain Milling Machine Power feeds and rapids.
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6in. **HOLBROOK** Toolroom Lathe.
15in. S.S. & S.C. Heavy Duty **OLDFIELD & SCHOFIELD** Lathe. Bed 12ft. 6in. Spindle speeds 65-332 r.p.m. Screwcutting speeds 1¼-22 threads.
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8¼in. **FABIUS** Lathe, 5ft. between centres. (New.)
Model HBY **CHURCHILL** Internal Grinder.
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DOUGLAS
OF HIGH WYCOMBE

SECOND-HAND MACHINES FOR IMMEDIATE DELIVERY

ENGRAVING MACHINES

PRATT & WHITNEY GG Type 1020 3-DIM. Diesinking Machine. £2,000

LATHES AND CAPSTANS

HERBERT No. 7 Combination Turret Lathe with equipment. £525
PRATT & WHITNEY 8in. Straight Bed Lathe. £90
JONES & LAMSON Turret Lathe. £45
ATLAS 8in. S.S. & S.C. Lathe. £90
HALIFAX 5in. S.S. & S.C. Lathe. £110
SOUTHBEND 4in. Bench Lathe. £45
MYFORD DRUMMOND 3½in. Lathe. £35
WARD No. 7A Combination Turret Lathe with ball chuck and adjustable boring and recessing toolholder. £380

FILING AND SAWING MACHINES

EXCEL Model O Bench Filer. £30

GRINDING MACHINES

BROWN & SHARPE No. 2 Surface Grinder. (Hand feed.) £75
BROWN & SHARPE No. 2 Surface Grinder. (Mechanical feed.) £375

MILLING MACHINES

RICHMOND 0-3 Universal with dividing Head and vertical attachment. £385
KEMPSMITH No. 1 Plain Horiz., 40in. × 10in. table. £325
MILWAUKEE No. 2 Horiz. 50in. × 14in. table. £475
PARKSON No. 2P Plain Horiz. 52in. × 12in. table. £400
MAXIMILLER Fixed Head Vertical. 59in. × 14in. table. £695
VICTORIA JUNIORMIL Plain Horiz. 28in. × 7in. table. £310
ADCOCK & SHIPLEY Model 1710 Thread Mill. 4½in. × 12in. cap. £200

PRESSES

BESCO 7 ton Power Press. Adjustable stroke. £100
NORTON No. 5 Standard Fly Press. £30

SHAPING MACHINES

NEW ENGLAND 10in. Stroke Shaper. £75

SUNDRIES

HILMOR DB/1 Tube Bender. £40
MORRIS 3 h.p. Double-ended Polishing Spindle. £45

WE ARE SOLE IMPORTERS OF THE FEINMESS RANGE OF CIRCULAR, PRECISION CIRCULAR, LINEAR AND PRECISION LINEAR DIVIDING MACHINES. FOR DETAILS OF MACHINES IN THIS RANGE PLEASE CONTACT US AT—

A. DOUGLAS CO., LTD.,
LINCOLN ROAD,
CRESSEX INDUSTRIAL ESTATE,
HIGH WYCOMBE, BUCKS.
Tel.: High Wycombe 4390 (5 lines).

Landis 10in. × 24in. Type "C" Universal Grinder. Internal Attachment. New condition.
Further details from:—
C. & G. OLDFIELD, LTD.,
15, Abercorn Street,
PAISLEY.

NEW MACHINE TOOLS FROM STOCK

GRANOR OF HALIFAX 28in. stroke Heavy Duty Shaping Machine. 400-440/3/50.

EARLY DELIVERY

MITCHELL OF KEIGHLEY 8¼in. Type DM8 Gap Bed Lathe, by 5ft. 3in. B.C. 400-440/3/50. January, 1961 delivery.
MITCHELL OF KEIGHLEY 10¼in. Type DM10 Gap Bed Lathe by 5ft. 5in. between centres. 400-440/3/50. December delivery.
MITCHELL OF KEIGHLEY 12¼in. Type DM12 Gap Bed Lathe by 6ft. 9in. B.C. 400-440/3/50. April delivery.
VICTORIA No. 2 Rapidmil Universal Milling Machine, table size 48in. × 11¼in. 400-440/3/50. December delivery.
VICTORIA No. V2 Vertical Milling Machine. Table size 45in. × 11in. 400-440/3/50. Instant delivery.

CENTAUR TOOL WORKS,
EYRE STREET, SPRING HILL,
BIRMINGHAM, 18
Tel.: EDGbaston 1118 & 1119 'Grams: Capstan, Birmingham

Taylor & Challen 60 Ton Power Press with variable stroke and roll feed.—BOX C632, MACHINERY, Clifton House, Euston Road, N.W.1.

For Sale, Hepworth Hydraulic Copy Attachment with 12in. lift, adjustable stylus head from 12in. to 27in., spindle hydraulically driven, as new, £1,000 or offer.—Apply, WORKS MANAGER, FAIRMAN PRECISION TOOLS & PRODUCTS, LTD., Station Road, Horley. (3678.)

Alba 24in. Shaper, 6 Ram Speeds, self-cont. Motorised, inching button, switchgear, good cond.—C. L. THOMAS, LTD., Stirling Road, Solihull. Tel.: 3075-6.

Gisholt No. 5 Universal Turret Lathe, all power feeds 19in., swing 22in. H.S. 12 speeds 28-730 r.p.m., 8 feeds, 3-phase electrics, chuck and coolant. Reconditioned, £475.
Southwark No. 2 1¼in. Capacity Capstan, 24 speeds 23-2,560 r.p.m., 3-phase electrics, coolant, bar feed, 15 collets. Rebuilt, £350.
Landis Type C Plain Cylindrical Hydraulic Grinder, 6in. × 18in., 3-phase electrics and suds. Reconditioned, £375.
Willson 7½in. × 36in. b.c. A.G.H. Gap Bed Lathe, S.S. & S.C., 2¼in. H.S., 9 speeds 26-477 r.p.m., 3-phase electrics, suds, chuck, etc. Reconditioned, £295.
THE ACORN MACHINE TOOL CO. (1936), LTD.,
610-614 High Road, Chiswick, W.4
CHI. 3416/7/8/9.

C.M.C. S.S. & S.C. Lathe, Swing 28in. over bed, 8ft. between centres, weight 7½ tons, 400/3/50.—A. McNAMARA & CO., LTD., New Line, Bacup, Lancs. 'Phone: Bacup 946.

Delapena Induction Heating Units. With generators, 2 and 6 kVA. For hardening, brazing, etc.—WILCOX & CO., Barr Street, Birmingham 19. NORthern 1234/5.

Taylor & Challen 4½ T.D.P. Double Geared double Action deep Drawing Press. Single pulley drive.—BOX C641, MACHINERY, Clifton House, Euston Road, N.W.1.

Automatic, Peterman 7 mm. capacity, complete with four tool slides, screwing attachments, excellent condition, motor drive, 400-440/3/50. Seen London area.—Telephone: Prospect 8237, or write BOX C505, MACHINERY, Clifton House, Euston Road, N.W.1.

LAYSTALL ENGINEERING COMPANY LIMITED
GREEN LANE, TETTENHALL,
WOLVERHAMPTON,
have the following machines for disposal.
ONE—**CARTER & WRIGHT** Keyseater.
ONE—**TROJAN** Oil Grooving Machine.
ONE—**MILLS** Straightening Press, 15 tons.
ONE—**JACKSON & BRADWELL** Dynamic Balancing Machine.
ONE—**ROWLAND** Double Headed Grinder.
ONE—**G.E.C.** Tempering Furnace, 40 kW.
Telephone: Wolverhampton 52006

B.S.A. Type RA Gridley 6 spindle Automatic, 1¼in. capacity. Universal threading attachment, 5th position parting off slide, Late type machine with equipment. 400/3/50. Excellent condition.
ACME Type R.A. Gridley 6 spindle Automatic, 1¼in. capacity. Universal threading on 4th and 3rd position, 5th position parting off slide, excellent condition, with considerable equipment. 400/3/50.
BUTLER 36in. Open Sided Planing Machine. Capacity 36in. × 24in. × 24in. Cutting speeds 15 to 130ft. per min. Feeds 5 to 50 cuts per in. 400/3/50.
SNOW Type T20 Table Surface Grinding Machine. 20in. dia. wheel. Surface of table 40in. × 28in. 400/3/50.
CHURCHILL Model H.B.A. Hydraulic Internal Grinding Machine. Fitted automatic sizing. Maximum swing inside water guard. 17in. dia. variable hydraulic traverse of table 18in. 400/3/50
BLISS 20 ton Ungeared Open Front Inclinable Power Press. Adjustable stroke ½in. to 2½in. Bed area 22in. × 13½in. 400/3/50.
H.M.E. Type C.26 Double Sided Geared Power Press. 100 tons pressure, 5in. stroke, Bed area 24in. × 22in. Between sides 24in. Motorised 10 h.p. 400/3/50.
New **PLANERS OF HUDDERSFIELD** 8ft. × 2ft. 6in. × 2ft. 6in. Planing Machine. 2 tool boxes on cross rail. Solenoid control. Lancashire Dynamo drive and control gear. 1944 machine.
RHODES No. 3 Double Sided Ungeared Power Press. 45 tons pressure, 2½in. stroke, Bed area 34in. × 37in. Between sides 34in. Motorised 400/3/50.
RUSHWORTH 10ft. × 4in. Geared Overcrank Power Guillotine. Automatic hold-down, front and rear gauges. 400/3/50.
WEBSTER & BENNETT 48in. Vertical Boring Machine. Rapid traverse. 400/3/50.

STANCROFT LTD.,
LANCASTER STREET, BIRMINGHAM, 4
ASTon Cross 2235.

Edgwick Vertical Keyseating Machine. 4½in. stroke, throat 8½in., max. daylight 15in. to 3in. Table 32in. × 9in. 5½in. cross slide traverse, 16in. table traverse, 6 spindle speeds, collet holders and collets. 1½ h.p. motor, 400-440/3/50. 690-1,440 r.p.m. Switchgear complete.—BOX C561, MACHINERY, Clifton House, Euston Road, N.W.1.

Lang Heavy Duty Boring and Facing Lathe, 14in. swing × 54in. between centres. Speeds 19 to 900 r.p.m. Feeds 36 to 432 c.p.i. Hole in spindle 1¾in. dia. £200 ex works O.N.O. London area.—BOX C575, MACHINERY, Clifton House, Euston Road, N.W.1.

Lund Precimax Model MPH 10in. × 36in. Plain Cylindrical Grinder.
WARD Nos. 16, 10/13, 10, 10B Combination Turret Lathes, covered beds. Also Ward OE Capstan Lathes.
CHURCHILL SLIDEWAY GRINDER, open-side, 35in. stroke, hydraulic. £750.
GIDDINGS & LEWIS NO. 25 RT Horizontal Borer, 2½in. spindle, 17in. Facing Head.
ARCHDALE RADIAL DRILL, heavy duty, low base and loose table.

HELIOT,
35, Greenwich Church Street, London, S.E.10

When answering advertisements kindly mention MACHINERY.

Newman

AUTOMATICS

BULLARD Multi-Au-Matic 7in. 8 spindle.
BULLARD Multi-Au-Matic 12in. 6 spindle.

BORING MACHINES

KEARNS No. 2 Horizontal Boring and Facing Machine, 3in. dia. travelling spindle (1953).
KEARNS No. 4 Horizontal Boring and Facing Machine, 4in. diameter travelling spindle.
WEBSTER & BENNETT Vertical Boring Machine, table 50in. diameter.
RICHARDS Type PRT Horizontal Floor Boring Machine, 3½in. travelling spindle, 28in. diameter facing head.
ASQUITH Horizontal Floor Boring Machine, 7in. diameter travelling spindle.
GIDDINGS & LEWIS No. 45 Horizontal Boring Machine, 5in. diameter travelling spindle.

CAPSTAN AND CENTRE LATHES

HERBERT No. 12 Combination Turret Lathe, 6½in. diameter hollow spindle.
NILES Heavy Duty Centre Lathe, S.S. & S.C. 17in. centre height × 28ft. between centres.
U.L.R.O. Heavy Duty Centre Lathe, 16in. centre height × 30in. between centres.

DRILLING MACHINES

HETTNER Radial Drilling Machine, 10ft. elevating arm.
TOWN Radial Drilling Machine, 4ft. 6in. elevating arm. (NEW.)
TOWN 30in. Single Spindle Boring and Drilling Machine.

GEAR MACHINES

ORCUTT Model HM24 Hydraulic Internal Gear Grinder.
GLEASON 3in. Straight Bevel Gear Generator.

GRINDING MACHINES

LANDIS Plain Hydraulic Cylindrical Grinding Machine, 18in. swing × 72in. between centres.
ORCUTT Model HM24 Internal Spur Gear Grinding Machine.
CHURCHILL Crankshaft Grinding Machine, 26in. swing × 84in. between centres.
CHURCHILL Turret Type Hydraulic Universal Grinding Machine, 16in. swing × 50in. between centres.
CHURCHILL Plain Hydraulic Cylindrical Grinding Machine, 20in. swing × 72in. between centres.
BROWN & SHARPE Plain Cylindrical Grinding Machine, 10in. swing × 36in. between centres.
B.S.A. LANDIS Plain Cylindrical Grinding Machine, 6in. swing × 30in. between centres.

MILLING MACHINES

CINCINNATI Model 5/72 Plain Hydromatic Milling Machine, table 91in. × 22in.
CINCINNATI 1/18 Automatic Manufacturing Milling Machine.
CINCINNATI No. 2L Plain Horizontal Milling Machine, table 52in. × 10in.
CINCINNATI No. 1M Vertical Milling Machine.
CINCINNATI No. 4 Dial Type Horizontal Milling Machine.
GRAFFENSTADEN Model FI101 Plain Horizontal Milling Machine, table 52in. × 10in.
TECHNOIMPEX Universal Horizontal Milling Machine, table 59in. × 16in. (NEW.)
PRATT & WHITNEY Model BL3620 3-spindle "Keller" Die Sinking Machine.
CENTEC Model 3R Automatic Production Milling Machine, table 25in. × 16in.

PLANING MACHINE

SUMMERSKILL Double Column Planing Machine; capacity 16ft. × 5ft. × 5ft. Four toolboxes.

NEWMAN INDUSTRIES LIMITED,

Machine Tool Division: YATE, BRISTOL

Tel.: Chipping Sodbury 3311. Telex. 44121.
Cables: "Dynamo Yate."

London Office: Terminal House, Grosvenor Gardens, S.W.1. Tel.: Sloane 8206.
Telex. 23289.

SOAG

LOW COST, HIGH QUALITY

LATHES

IN STOCK

IMMEDIATE DELIVERY

VERTIMAX 16in. Production Lathe, type F (1953). Dial chuck 9½in. Speed range from 135 to 473 r.p.m. H.p. motor 10.
LE BLOND Heavy Duty 20in. size S.S. & S.C. All Geared Head, motor drive. Swing 22½in. Between centres 72in. 16 sp. speeds 12-528 r.p.m. H.p. motor 12½.
DEAN, SMITH & GRACE 30in. × 49in. swing Surfacing and Boring Lathe. Type 30/9AN. Swing in gap 49in. Distance spindle to turret face 45in. 16 spindle speeds from 3.19 to 343 r.p.m. H.p. motor 12. No. screwcutting.
DARLING & SELLERS 12½in. × 8ft. 6in. Motor drive. Vee bed and gap. Norton type gearbox. T.T.A. 24 spindle speeds 9-416 r.p.m. 1950 machine.
CRAVEN 15½in. × 15ft. S.S. & S.C. All-geared Head. V-belt motor drive. Two saddles with geared taper turning attachments. Swing over bed 31in.; swing over saddle 22in. Admits between centres 26ft.; 16 spindle speeds from 1.5 to 145 r.p.m. H.p. motor 12½.
SCHIESS DEFRIES 15½in. × 16ft. Super-Express S. & S Lathe, type YDE. Motor drive with automatic controller. Speed range from 20 to 600 r.p.m. Swing over bed 34½in. Swing over saddle 22in.
LANG 18in. × 7ft. S.S. & S.C. Lathe. V-belt motor drive. Norton type gearbox, one saddle. Swing over saddle 25in. Six spindle speeds from 10.25 to 60 r.p.m. H.p. motor 20.
DEUTSCHLAND 18in. × 30ft. Heavy Duty with copy turning over full length. Three saddles with compound tool slides. Power traverse to saddles and tailstock by separate motors. Roller bearing spindle. Feeds by threaded shaft. Three-shear bed. Swing over bed 36in. Swing over slide 20in. 24 spindle speeds. H.p. motor 68.
SOMUA 26in. × 11ft. Heavy Duty S.S. & S.C. all-geared head, motor drive, rapid power traverse to saddle by separate motor. T.T. attachment. Swing over bed 52in. Swing of saddle 38in. 18 spindle speeds from 2 to 100 r.p.m. H.p. main motor 44 PS.
NOBLE & LUND 48in. × 10ft. S.S. & S.C. Heavy Duty and Faceplate Lathe. ; Front and back saddles on separate slides. Rapid power traverse by separate motors. Swing over saddle 6ft. 8in. Dia. faceplate 8ft. 16 spindle speeds 0.75 to 40 r.p.m. H.p. main motor 30.

Most of the above machines are ready for delivery.

INSPECTION INVITED

Send us your enquiries.

SOAG MACHINE TOOLS, LTD

JUXON STREET,
LAMBETH, LONDON, S.E.11

'Phone: RELiance 7201
'Grams: "Sotoolsag, London, S.E.11"

Loewe Boring and Facing Lathe, high speed machine, 475 to 3,000 r.p.m. Swing 16in. Multi-speed motor, 400/3/50.—BOX C606, MACHINERY, Clifton House, Euston Road, N.W.1

Thompson & Munroe 2-Wire Automatic Straightening and Cutting Off Machine for sale. Capacity from 18 s.w.g. to 11 s.w.g. Cuts off any length up to 10ft. Arranged motor drive 400-440/3/50. Spinner type straighteners.—F. J. EDWARDS LIMITED, 359, Euston Road, London, N.W.1, or 41, Water Street, Birmingham 3.

Corona Heavy Duty Vertical Drilling Machine. No. 5 Morse Taper Excellent condition.

Further details from:—
C. & G. OLDFIELD, LTD.,
15, Abercorn Street,
PAISLEY.

TATE

GRINDING AND LAPPING MACHINES

MOPCO 12in. by 48in. Cylindrical.
COVEL Tool and Cutter Grinding Machine.
MATRIX No. 16 Plain Straight Grinder.
MATRIX No. 10 Universal Thread Grinder. 10in. by 36in.
Two **MATRIX** No. 6 Universal and Internal Thread Grinders. 3in. by 10in.
HEALD No. 8 Sizematic Internal Grinder.
New **RIBON RUR** 10in. by 30in. Universal internal and external grinding machine.

MILLING MACHINES

Vertical

ASQUITH HK1 Vertical Milling Machine.
FRITZ WERNER No. 3230 Precision Vertical Milling Machine. 24in. by 8in. table. Longitudinal and cross power feed to table.
VICTORIA Duplomatic Hydraulic Die Sinking machine (almost new).

Horizontal

ADCOCK & SHIPLEY Model I with auto cycle.
ADOCK & SHIPLEY Model 2b Plain Horizontal Milling Machine. (Unused.)
EDGWICK No. 1 Horizontal Milling Machine 40in. by 10in. table.
Four **DENBIGH** Model No. C.4 Horizontal Milling Machines.
CINCINNATI 18in. Mfg. Mill.
VICTORIA Junior Mill (New).
CINCINNATI Model 4/36 Hydromatic Milling machines (Simplex).
New **VICTORIA-ELLIOTT** Junior Mill.
SANT ANDREA Model UFO/5 Heavy Duty Horizontal Miller 78½in. by 16in. table. Table travel 47in.
SANT ANDREA Model UFO/5 extra heavy duty horizontal miller 86½in. by 19in., table travel 67in.

LATHES

SMART & BROWN Model M 4in. Precision Tool Lathe.
Two **COLCHESTER** 6½in. Triumph Centre Lathes.
LANG 10½in. by 10ft. between centres. Centre Lathe.
MORANDO Model TUR 350 14in. Centre Lathe. 5ft. 6in. between centres.

New Address
TATE MACHINE TOOL CO. LTD.
348-354 KENSINGTON HIGH STREET
LONDON, W.14
WESTern 7031 (5 lines)

RING BELLS *for machine tools*
LEEDS 63-7398

National 2½in. High Duty Forging machine—air clutch.—C. DUGARD, LTD., Denmark Villas, Hove 32471.

Churchill 12in. × 36in. Universal Grinder. Hydraulic Stroke. Internal Attachment. Complete Machine. Full details from:—
C. & G. OLDFIELD, LTD.,
15, Abercorn Street,
PAISLEY.

17-ROLLER PLATE STRAIGHTENING or PROCESSOR LEVELLING MACHINE FOR SALE.
By HEAD WRIGHTSON
for rectifying mild steel sheet having a yield point not exceeding 20 tons p.s.i., in widths up to 96in. and up to 16 s.w.g. Two brushes and two paraffin sprays. 57 backing-up rollers. Motor drive, 50 h.p., 400-440/3/50. Weight about 20 tons. Floor space 18ft. × 9ft.
F. J. EDWARDS LTD.,
350, EUSTON ROAD, LONDON, N.W.1.
Euston 5000; or
41, WATER STREET, BIRMINGHAM 3
Central 7606

Kendall & Gent Profile Milling Machine, with twin spindle. S/No. 10953A. Asquith Twin spindle Profile Milling Machine, spindle speeds 250 to 3,000 r.p.m.—BOX C555, MACHINERY, Clifton House, Euston Road, N.W.1.

LEONARD ROTH
ABBOT ST., KINGSLAND HIGH ST.,
DALSTON JUNCTION,
LONDON, E.8.
Tel.: CLIssold 0513/4.
TERMS ARRANGED
COLCHESTER TRIUMPH 7in. Centre Lathe. 4ft. between centres, 400/3/50. £195.
AMERICAN TOOL WORKS 9½in. Lathe, 4ft. 6in. between centres, 400/3/50. £150.
MORETON ½in. capacity Capstan with bar-feed, 400/3/50. £50.
TAUCO ½in. capacity Bench Drill, 4 speeds, 400/3/50. £25.
EDWARDS 36in. Treadle Guillotine, 18 Gauge. £35.
KEETONA 4ft. Power Guillotine, 16 Gauge, 400/3/50. £150.
MUIR Planing Machine, 6ft. × 3ft. × 3ft., with motor and countershaft. £185.
PLEASE WRITE FOR LISTS.

PUMPS

Two Used Weir Vertical Boiler Feed Pumps each 6in. × 8½in. × 18in., 2,700 g.p.h. Excellent condition.—BOX C611, MACHINERY, Clifton House, Euston Road, N.W.1.

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W. 8969 Brayshaw Two-stage High Speed Steel Furnace. REF. CA/3. New. Any reasonable offer accepted.—DUCK, 6a, Broad Street, Teddington, Middlesex.

VARIABLE SPEED GEARS

12 Size 2U Stone Wallwork PIV variable speed gears, assorted ratios; full details on request.—R. R. BRITTON, LTD., Memorial Road, Hanham, Bristol. Telephone No.: Bristol 674817.

AUCTIONS

On the instructions of the Liquidators E. R. NICHOLSON, Esq., F.C.A., and ARTHUR T. EAVES, Esq., F.C.A., re VATRIC (Manufacturing) LTD. (in creditors voluntary liquidation).

G. F. SINGLETON & CO.

will offer for SALE BY AUCTION, on the premises, on **WEDNESDAY, 15th MARCH, 1961, at 11 a.m. prompt** (subject to conditions of sale and unless previously sold by private treaty) the

MODERN FREEHOLD
SINGLE STOREY FACTORY
47,500 sq. ft. floorspace (mainly built 1957–1960)
known as
Bakewell Works, Duckworth Street,
off St. Helens Road, Daubhill,
BOLTON, Lancs.

THE PREMISES are located about 1½ miles to the South West of Bolton Centre, close to the main road to Liverpool in an area FREE FROM TRAFFIC CONGESTION.
They are easily accessible both for work-people and by road transport.
There are good loading facilities with adequate vehicle parking space; administrative and canteen buildings; electric power, lighting and industrial gas installations; modern oil-fired automatic heating plant.

VACANT POSSESSION ON COMPLETION

THE LAND is Freehold, free from rentcharge and contains an area of about 12,782 square yards, a portion of which has been levelled and part concreted ready for building extensions of at least 10,000 square feet floorspace.

ALSO THE
MODERN SHEET METAL MACHINERY,
MACHINE TOOLS, POWER PRESSES,
SPRAYING & ASSEMBLY PLANT,
VALUABLE OFFICE & WORKS EQUIPMENT
including

POWER PRESSES: (Motorised) "Rhodes" 200 ton, 2 "Taylor & Challen" No. 370, "Edwards" 75 ton, "H.M.E." type OP75, 2 type OP30 and 2 type OP20, "Lecra" 60 ton and type OF 25 ton.

PRESSES: (hand) "B.N.L." No. 3B Arbor, Toggle, "Worcester" 6 ton and 5 Fly.

SHEET METAL MACHINERY: (Mainly motorised) "Rhodes" 10ft. Motorised HYDRAULIC PRESS BRAKE, No. 02 4ft. Open-end OVERCRANK GUILLOTINE and 8ft. Fluid Driven Shears; "Edwards" 4ft. Cramp Folding, "Turner" Hydraulic Tangent Bending, "Rhodes" 30in. Beam Folding, "Quickwork" No. 48L Stamping and Trimming, "Rhodes" No. 38 Angle Bending, "Frost" Grooving, "Besco" Swaging and "Lecra" type DP5 Rotary Seaming Machines, Bending Rolls 36in. wide.

MACHINE TOOLS: (motorised) "Alba" type 4S 18in. Crank Shaping, "Cincinnati" No. 2 TOOL & CUTTER GRINDING, "Do-All" Model V-16 Metal Bandsawing, "Corona" Model 2NX Radial Drilling, "Brown & Sharpe" No. 2 UNIVERSAL MILLING and "Magerle" type F10 HYDRAULIC SURFACE GRINDING MACHINES; "Willson" 7½in. and "Colchester Student" 6in. S.S. & S.C. Lathes, "Herbert" No. 2D Bar Feed CAPSTAN LATHE, "Velox" 10in. Power Hacksawing, Drilling and Tapping, Pillar and Suspended Electric Spot Welding and 2 "Canning" type 1612 Double-ended Electric Polishing Machines.

GENERAL: "Wild Barfield" 7½ kW. Muffle Furnace, D.C. Generator Sets, "Murex" Welding Transformers, Electric Power Tools, Electric Chain Blocks and Lifting Tackle, BONDERISING AND PAINT DIPPING PLANT with GAS-HEATED INFRA-RED DRYING, 2 "Rotowash" Steel SPRAY BOOTHS, ENDLESS CHAIN CONVEYOR (Throughout Works—375ft. long), Roller and Belt Assembly Conveyors, Degreasing Plant, Electric Time Recorders, Weighing Machines, Canteen Equipment and Furnishings, 2 "Lansing Bagnall" Model P FORK-LIFT TRUCKS, Pallets, Stillages, 2 "Reavell" and 1 "Broom & Wade" 2-stage AIR COMPRESSOR SETS, Large bore Gas Piping and Works Equipment, NEW STORES and LOOSE TOOLS.

OFFICE EQUIPMENT: Wide range of Modern Steel and Light Oak Executive and General Office Furniture; 15 Typewriters, Duplicators and Calculators, Glazed Steel Sectional Partitioning, Drawing Office Machinery and Instruments.

The Lots may be inspected between 10 a.m. and 4 p.m. on 1st/3rd, 6th/10th and 13th/14th March, 1961, or by appointment with the Auctioneers.
Particulars of the premises and catalogues of the plant may be obtained from G. F. SINGLETON & CO., Industrial Auctioneers and Estate Agents, 9 Richmond Terrace, BLACKBURN (Tel. 7722/3) and Lloyds Bank Buildings, 53 King Street, MANCHESTER 2 (Tel.: DEAnsgate 7954/8) or from the Liquidators, E. R. NICHOLSON Esq., F.C.A., Messrs. Peat, Marwick, Mitchell & Co., 11 Ironmonger Lane, London, E.C.2 (Tel.: MONarch 8888) and Vatric House, Sloane Street, London, S.W.1 (Tel.: BELgravia 7000) or ARTHUR T. EAVES Esq., F.C.A., Messrs. Harry L. Price & Co., 47 Mosley Street, Manchester 2 (Tel.: CENtral 1905) or from the Solicitors, Messrs. GODDEN HOLME & CO., 5 Upper Belgrave Street, London, S.W.1.

SITUATIONS VACANT

If you do not wish your reply to any Box No. advertisement in this section to be forwarded to certain firms, please advise us. Your reply will then be destroyed but you will not be notified as this would disclose the identity of the advertiser.

Royal National Institute for the Blind.

HETHERSETT Vocational Guidance Centre for Blind Adolescents, near Reigate, Surrey.

LIGHT ENGINEERING INSTRUCTOR required for September, 1961, or earlier. Applicants should possess O.N.C. or C. & G. Cert. (Mechanical Engineering) or equivalent, with good experience in industry.

The Centre gives vocational guidance, further education and social training to 25 blind boys and girls (aged 16-18 years). The Instructor is required to introduce them in small groups to the usual machine operations and Light Engineering type of work and must also take an active part in the life of the Centre.

Premises are being extended to accommodate 35 students with considerable development of the Light Engineering workshop. The successful applicant must therefore be available for consultation with the present Instructor during the summer term.

The Instructor can be resident or non-resident, but resident duties are required in either case. Salary on scale according to qualifications and experience with appropriate Superannuation and full emoluments if resident.

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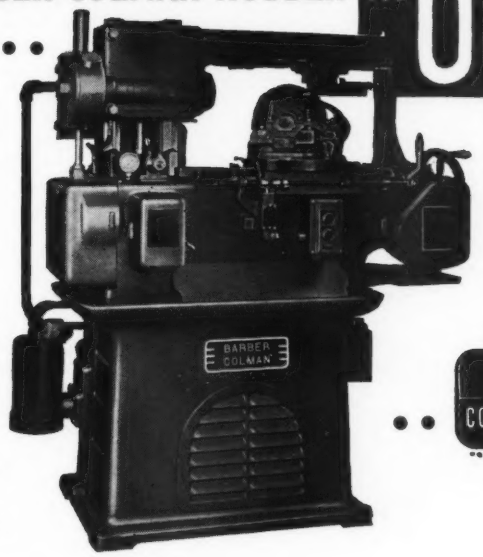

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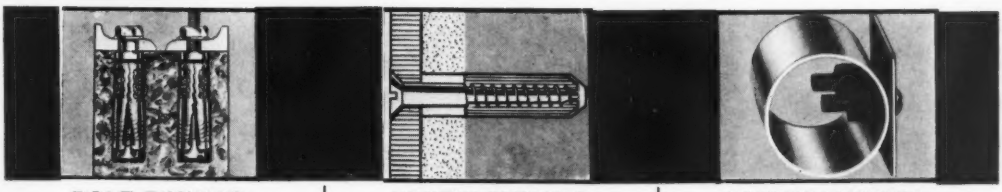

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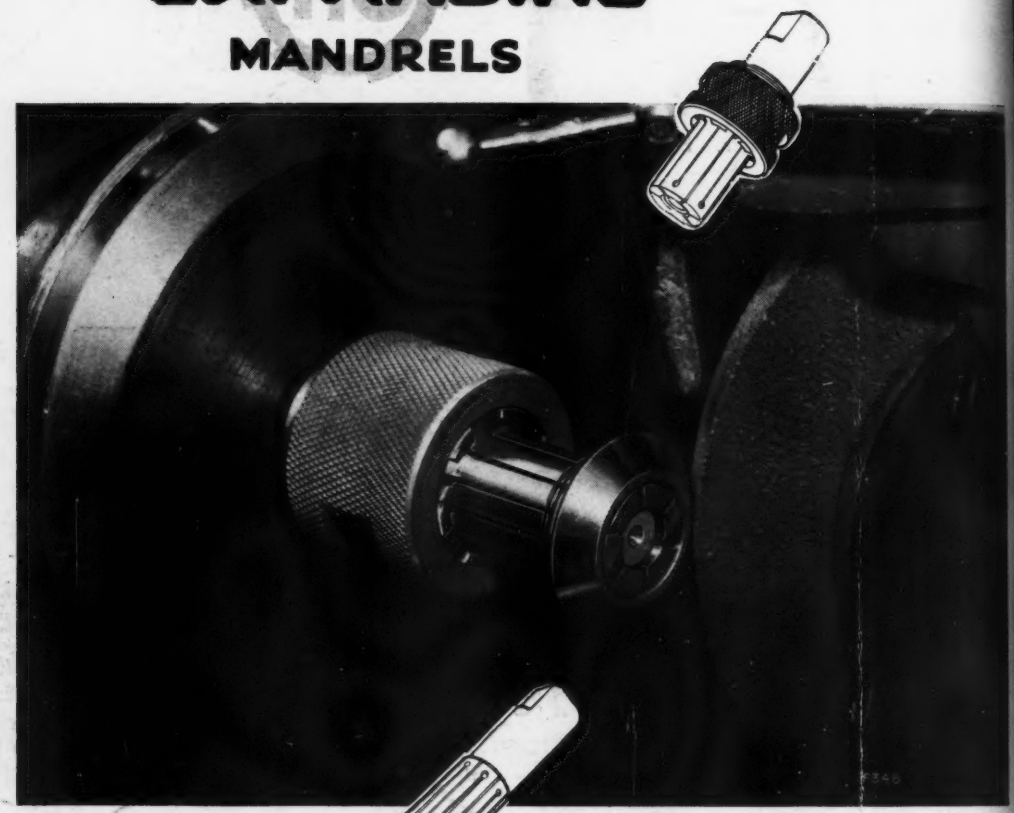
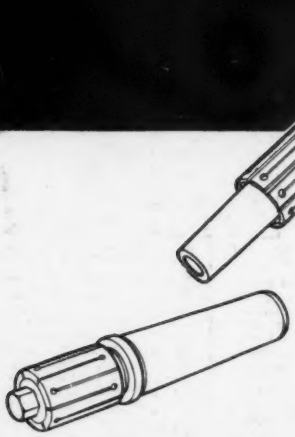
MANDRELS





Range of sizes and types to suit bores from $\frac{1}{32}$in. to $5\frac{3}{16}$in. dia. Types available for Back and Endwise Clamping, mounting between centres or to fit directly into the machine spindle. One type can be pneumatically-, hydraulically- or mechanically-operated or actuated from the tailstock. Interchangeable sleeves. Expanding sleeve can be made to accommodate plain, splined, square or threaded diameters and the shank can be made to suit customers' specific work-head or machine. Accuracy of expansion guaranteed concentric within 0·0004in. Very high expansion of sleeves ranging from $\frac{1}{64}$in. to $\frac{3}{16}$in. according to types and sizes. Sleeves exert a powerful grip over their entire length.

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